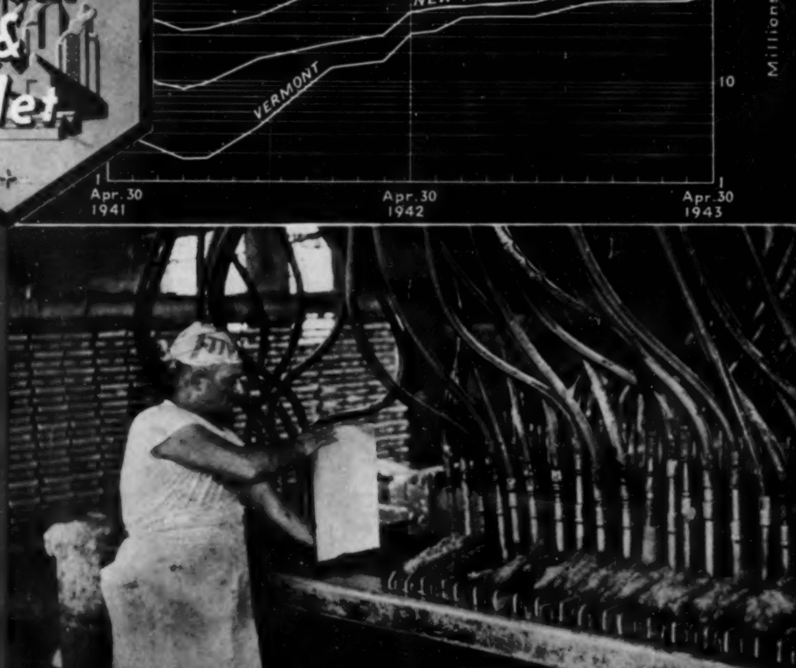
CHEMICAL & METALLURGICAL ENGINEERING



SEPTEMBER, 1943

CANADA BUILDS FOR WAR AND PEACE

The Dominion entered the war Sept. 10, 1939. Her vastly expanded and diversified chemical industry has not only met many of her wartime needs and those of others of the United Nations, but also will be of immense value to the country's economic structure in postwar years. See pages 98-101.

NEW ENGLAND IN THE WAR AND IN THE POSTWAR

Six states with only 4.5 percent of the new war plants are turning out 10.1 percent of all war contracts. Better prepared for her war job, New England will face less serious problems of reconversion. Yet this advantage will be lost unless she revives research to develop new products. See pages 119-126.

STEARIC ACID FOR CANDLES AND COSMETICS

Stearic acid, one of our older chemical industries, has undergone many changes since Ernst Twitchell's time. Some of these of interest to chemical engineers are illustrated in this month's Chem. & Met. Pictured Flowsheet of a modern plant appearing on pages 132-135.

Washington News pages 140-42

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ESTABLISHED 1902

In this Issue

SEPTEMBER, 1943

Volume 50 — Number 9

England and New England in the War 95
EDITORIAL FOREWORD

Canada Builds Chemical and Explosives Industries 98
By JAMES MONTAGNES

Canada's Magnesium Industry 100

Britain Bounces Back 102
By PAUL WOOTON

Building the World's Largest Mills-Packard Acid Plant 103
By ANDREW M. FAIRLIE

Planning Now for After the War 106
By HAROLD E. THAYER

Formulating Fertilizers for 1943–1944 109
By F. W. PARKER and W. H. ROSS

Chemical Plant Construction Planned for 1943–1944 111
By R. S. McBRIDE

New Approach to Continuous Reactor Design-III 113
By A. BROTHMAN, A. P. WEBER and E. Z. BARISH

New England in the War and in the Postwar 119
A CHEM. & MET. REGIONAL SURVEY

Stearic Acid, Red Oil and Glycerine 132
A CHEM. & MET. PICTURED FLOWSHEET

Chem. & Met. Plant Notebook	117	Personalities	167
Process Equipment News	127	Meetings and Conventions	175
Chemical Engineering News	139	From the Log of Experience	185
News From Washington	140	News From Abroad	190
Readers' Views and Comments	147	Chem. & Met. Bookshelf	203
Interpreting Washington	149	Chemical Economics and Markets	215
New Products and Materials	157	New Construction	224

An index to advertisers will be found on page 398

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Aviation—A Progress Report

The Lessons of War Become the Key to a Richer Peace

Tunisia, Pantelleria, Sicily — stepping stones to momentous events! But that is not all. For they spell out across the blue waters of the Mediterranean a pattern of invasion that has progressed far since last summer's first major Commando operation against the French coast.

From Dieppe, you remember, too many of the raiders never got back. But in Tunisia, and on through Sicily, the Allied might plowed inexorably forward, winning objective after objective at a surprisingly low cost in casualties. Air supremacy over the battlefield? Yes. But we have learned, too, how to save lives and shorten the war by strategic air bombardment as a prelude to invasion.

This is the fifteenth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

Thus the bombardment plane — rarely seen by the doughboys on the fighting fronts — is destined to save their lives by hundreds of thousands in the decisive attacks that are to come. This fact is confirmed by the cold calculations of the responsible strategists. It will give renewed courage and confidence to every member of the armed forces and of the home fronts throughout the United Nations.

For instance: thorough strategic bombardment of an objective reduces by nearly fifty per cent the surface forces required for invasion. Anticipated losses are reduced from more than fifty per cent of the original ground force to about twenty per cent. Precision bombardment — as used on railroad objectives in Rome — reduces this percentage of loss still further when it is followed by offensive action on the ground.

The inference is clear. Effective prosecution of the war will require smaller ground combat forces and much larger air forces than some of our strategists once thought.

Our most urgent need, then, is for ever-mounting fleets of aircraft. And, fortunately, this is just what we are getting. The American aircraft industry now is producing as many airplanes as all the rest of the world combined. In 1938 we made 100 planes a month. Now we make three times that many in a single working day. By the end of 1943, our production rate will be about 10,000 a month.

But at this stage of the war, types of planes are more important than mere numbers. In the early months the program was heavy, and properly so, with single-engine trainers. Then, as training planes accumulated, the emphasis shifted to heavier types. Now we are turning out multi-engined bombers at a rate that is the envy of the entire world. Some months ago the President revealed that we were manufacturing 500 long-range bombers every month. The figure was conservative even then. And soon we shall be producing planes of this one type at a rate adequate to replace the normal losses of a fleet of at least 1000 American heavy bombers operating as continuously as the weather will permit.

A glimpse of the poundage production may help us still further to evaluate the miraculous achievements of the aviation industry as a whole. It was 89,000,000 in 1941 . . . 291,000,000 in 1942 . . . 911,000,000 in 1943 . . . and 1,417,000,000 in 1944

– if we need it. There you have the magnificent record of the American aircraft manufacturing industry – a monument to the cooperation of industry, labor, government, and to all-out teamwork between the aviation industry and those other industries which have converted their facilities to the manufacture of airplanes.

What of our enemies and our Allies?

German production probably has flattened out at 2500 a month – with downward revision in immediate prospect. Japan may be able to produce as many as 1000 planes a month – until we get our new long-range super-bombers in sufficient numbers to whittle down that figure. Italy may be able to turn out her 500 a month – for a little longer. At best the maximum Axis monthly total is 4000.

Add to our monthly score of nearly 8000, a total of approximately 4000 for Britain, Canada and Russia, and the United Nations score comes to 12,000 monthly. There we have a three to one advantage for our side. And between our own rising production and the brilliant operations of our bomber commands we should soon boost the ratio well above that figure. Therein lies the certainty of continued and growing air superiority over all the far-flung battlefields.

The critics of American airplane quality have been silenced ever since the ratio of enemy combat losses to our own on bombardment missions surpassed four to one. In the Pacific where our heavily armed and armored planes are knocking off the desperately stripped racing craft of the Nipponese, enemy losses often run as high as eight to one or more. In the Mediterranean theater, where the Italians were abandoned by their Allies, the story is much the same. Only in the well-defended homeland of the Nazis do we sometimes drop below the average, but even in those rare instances the ratio is still well in our favor and the effectiveness of our bombardment is adding constantly to our margin.

* * *

Behind the production lines the battle of research and design still rages. In many a laboratory night-shift, on many a secret test field, new and terrible surprises for the enemy are in the making. Super-bombers, destined for Tokyo, have long since passed out of the design stage and the Japanese may learn about them almost any day. New discoveries, designed to sow swift and silent devastation, are farther along than our enemies believe. No longer will fog or storm or night be permitted to fight on the side of our foes.

The men of science who are toiling to broaden the horizon of our knowledge stand today on the threshold of discoveries that have been sought for centuries. New reservoirs of power may soon exert a profound influence in many fields of technology and through them on our way of life.

Once the war is won these new discoveries will be translated into better living. No longer will countless thousands spend their lives within their own communities or countries. New efficiencies in transportation will bring world travel within the reach of many who once had to stay at home. New family vehicles will navigate the skyways as easily and safely as the highways. Already more than a dozen manufacturers of airplanes, ships, automobiles, and electrical equipment are designing, building, or flying rotary-winged aircraft such as the helicopter or autogyro to meet the needs of tomorrow's families. New and safer aircraft of the fixed-wing type are ready for production as soon as materials become available.

The quality that now makes each of our war planes worth so many of those built by our enemies will be translated into the sturdy reliability demanded by peacetime operation. The devices that seek out and find our enemies behind the veil of fog or darkness will, after the war, reduce weather hazards to the point where they will be no greater in the air than on the ground.

Science and industry will continue to do their jobs and do them well. But if the world is to be made a better place for men to live in, statesmanship must not fail to do its part.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

CHEMICAL
& METALLURGICAL
ENGINEERING

SEPTEMBER, 1943

ENGLAND AND NEW ENGLAND IN THE WAR

WITHOUT purposely planning it as a tribute to Britain's four years of splendid war effort, this issue of *Chem. & Met.* has taken on a distinctly international aspect. Various of its articles and editorial features emphasize the strong bonds of friendship and interest in common problems that bind us so closely to our Allies in arms, particularly to our chemical cousins in England and Canada. In passing these pages on to our readers, we cannot help but express the fervent hope that the present spirit of harmony may long prevail as together we face the peacetime problems of reconstruction.

Paul Wooton, our friendly ambassador and Washington correspondent who has just returned from England, brings us a glowing account of the wartime achievements of the British chemical industry. He found a new and surprising sort of cooperation developed in the face of common danger. Panels made up of technical men from competing companies visit plants to advise on methods of increasing efficiency and lowering costs. Research, amply supported for the first time in England, has rapidly produced remarkable results—at the same time helping to break down the traditional barriers of secrecy and self-interest. Even in the face of war's destruction, English chemists and chemical engineers have met regularly and often to discuss their plans for the future development of their industry and profession.

From such a meeting in London on July 9 came the good news that our distinguished fellow countryman, Wallace P. Cohoe, had been unanimously elected to the presidency of the great Society of Chemical Industry. Not since the 1928–29 term of the late Dr. Arthur D. Little, has an American chemist or engineer been so honored. This, in turn, is a distinction for the American chemical industry and one we hope will be appropriately celebrated here in New York on October 22 when the new president is officially installed—or perhaps we should say, invested with the traditional chains of his high office.

The same meeting elected another Canadian-born chemist, Victor G. Bartram, of Montreal, to be one of the vice presidents for 1943–44. Thus further recognition was accorded to the achievements of chemical industry on this side of the Atlantic. That Canada's share has been of great substance and has contributed much to the war program of the Allied Governments is evident from the article in this issue by our Toronto correspondent. He shows how the Dominion in its four war years has trebled the value of its chemical production, has multiplied its output of explosives and chemical munitions by more than sixty times. From its research laboratories has come the ferro-silicon process that is employed in many of our magnesium plants. The most powerful super-explosive used in this war, according to Canada's American-born engineering-trained Minister of Munitions, C. D. Howe, is made by a process which originated in Canada and has been further developed by joint Canadian-American action. Out of all this experience is certain to come a stronger, more resourceful chemical industry to help in the further industrial development of our good northern neighbor.

By happy coincidence the writer of these words spent a few days of August in New England, making interviews and obtaining the data on which this month's editorial staff report is based. Often he was reminded of the similarities with Old England, of the traditional combination of culture and conservatism that has sometimes threatened to overshadow New England's great heritage of Yankee ingenuity. Yet here too there is a new spirit of industrial cooperation that is already injecting life and hope into old and ailing enterprises. People are not only talking of research but they are doing something about it. A unique foundation has been established to promote technical progress, particularly in smaller companies that have lacked research facilities. Studies are under way of new products, especially of chemicals and allied materials that are imported into New England

in an estimated total value of a hundred million dollars a year. All agree that the years directly after this war will make or break New England, depending to a considerable extent on how she uses her well trained chemists, physicists and engineers.

From this miscellany of impressions gained at home and abroad, we are encouraged to believe that the world is making progress that will be of long-time chemical importance after this war is won. First is a greater willingness to share our achievements in science and technology. Second is a growing appreciation of the international character of our common problems and the fact that they can be solved only by close collaboration with our Allies. And, finally, there is a new and challenging spirit of enterprise and initiative on the part of chemists and chemical engineers everywhere. It augurs well for the future of the industry and profession.

PATENT LAW CHANGES SHOULD WAIT

Revision of the patent law in some particulars is needed to make more effective its service to the public. That this can be done without disadvantage either to inventor or industry is made quite clear by the recent, constructive report of the National Patent Planning Commission. The Commission also emphasizes an equally important fact, namely, that the war effort is not being handicapped by any present inadequacy of the patent law.

Therefore, delay in revision of the law will not be serious. This view is confirmed in a letter from a patent authority in industry, A. W. Deller, whose letter we are pleased to print on page 147 of this issue. In fact, we are persuaded that delay in revision of the law will probably be helpful to all concerned.

This will make possible more help from experienced and busy industrial executives and more time and thought from conscientious members of Congress. The result will be a better review of needed revisions and the avoidance of hasty action that might lead to worse conditions than we now experience. Time will help to identify and subsequently eliminate those busybodies who seek patent "reform" with plausible but superficial arguments.

This is certainly not the time for the patent committee of Congress to start tinkering with the patent law. Rather, it is to be hoped that they will wait until there is some relief from the pressures of war so that the needed changes can be studied seriously and conscientiously in the long-time public interest.

LOOK OUT FOR HIDDEN SUBSIDIES

Synthetic rubber and the vinyl resins are competitive materials for many war uses. Later they will be similarly competitive in many industries. Just now this inter-commodity competition seems to be badly distorted by artificial factors and the resin industry is rightly concerned about the danger of continuing these relationships after the war is over.

This distortion comes about because the Army pays to the Rubber Reserve Company a subsidy of 17.5 cents per pound for the synthetic rubber used by many contractors in making military goods. This is a reimbursement to Rubber Reserve for the money it would otherwise lose by paying the costs and management fees of companies making the rubber in government-owned plants and subsequently selling the rubber to rubber goods makers at less than cost. Often Army purchasing officers consider that the Army is paying only the reduced or subsidized price. They fail to realize that they also pay an additional 17.5 cents per pound of contained rubber. As a consequence, they sometimes choose goods containing synthetic rubber when others made with vinyl resins might actually be cheaper.

These facts have been pointed out to the War Production Board, to Rubber Reserve and to Army executives. The makers of other plastic materials feel that this situation is unfair to them, because their materials do not get the deserved consideration in comparison with synthetic rubber. For example, the Army thinks that a rubber raincoat or a rubber shower curtain is cheaper than a vinyl-coated fabric for the same service. Actually, the rubber-coated goods may be more expensive to the government when the subsidy on the contained rubber is taken into account.

Just now there is more business for plastics makers and rubber makers than they can handle. No one is worried about surpluses of unsold goods. Every manufacturer in both groups could sell much more if he could produce it. Nevertheless, this type of distortion is serious both for now and for the postwar. It gives altogether wrong impressions of relative economy.

Synthetic rubber makers also have something to worry about in this situation. To avoid being embarrassed after the subsidy has been withdrawn, they should be very careful now that they do not build up unwarranted expectations of much lower costs. Both parties to this legitimate and important competition will gain if a fair appraisal of relative merit is made on the basis of actual costs as well as performance. Hidden subsidies like this may be justified in wartime, but they are a very poor basis for establishing permanent markets.

HOW FAR SHOULD AAA GO?

Competition of government agencies with fertilizer companies has been all too frequent in recent years. Lately, the Agricultural Adjustment Agency has denied any desire further to extend this activity in the handling of materials for soil improvement. The industry naturally wishes that this disclaimer could result in actual withdrawal of A.A.A. from their field. We fear, however, that under the guise of war emergency there will be further efforts on the part of the government to nationalize this important industry.

Fertilizer requirements this year will far exceed any previous demand. Every commercial producer will have difficulty in meeting the orders placed with him. The opportunity for fertilizer to contribute to food supply next year is so great that nothing must interfere with the effectiveness of this movement. Even A.A.A. recognized this and stated its intention to take only "surplus" fertilizer materials.

There are some figures for lime used in agriculture

which throw an illuminating sidelight on this subject. A.A.A. has been distributing agricultural lime and, in late years, has been taking over a greater and greater percentage of the total business. In 1938 A.A.A. distributed about one-half of one percent of the total. In succeeding years the share distributed was 8 percent, 24 percent, 60 percent, and finally 64 percent last year. For 1943, certain A.A.A. representatives suggested their desire to distribute 14 million tons of agricultural lime which is 80 percent of the total amount that was distributed by all agencies last year. There has been official regret expressed that A.A.A. is not likely to get more than half as much agricultural lime for distribution this year as it wishes.

Some used to believe that T.V.A. was the greatest threat of government competition with industry in the fertilizer field. Yet at no time did it ever expropriate so big a percentage of any division of the fertilizer business as A.A.A. has been attempting to take over. Certainly, when the industry is being pressed to do its huge job, it should not find itself under fire from subsidized competitors of this sort. Patriotism of even the most ardent type becomes seriously strained under these conditions.

WASHINGTON HIGHLIGHTS

MANPOWER for certain chemical process industries continues to be a serious bottleneck. Some of the war program is actually slowed at the fighting front because aircraft production is not going forward as rapidly as it should. However, most of the Washington commotion about manpower right now is not as genuine as it sounds. The orators' talk about drafting fathers is more intended to drive such young men into war employment than to get them into the Army. With war prospects as existing during late August, high Army officers seemed about equally divided as to whether they needed more men in uniform or in the war plants.

STANDARDS for commodities must sometimes be established by governmental action. Recently, however, certain alphabetical agencies have sought to impose grade standards on foods and textiles and this has aroused much justifiable opposition. Industry requires standards for its products mainly to guide the business relations between producer and seller when both are industrial groups or units. Trade association work provides one of the best means for formulating such standards. Sometimes these commercial standards are developed in cooperation with the National Bureau of Standards or other government agency. But in these cases the government bureau is often merely a variety of industrial purchaser. It is important to keep these facts in mind when over-zealous government workers try to impose arbitrary standards. Participation in government conferences where the government extends a convenient facility for cooperation is desirable. But this does not in any way justify the government in initiating, formulating and imposing standards that are not in the public interest. Even in wartime, such an autocratic policy hurts government as much as it does business.

MANAGING OF INDUSTRY from alphabetical agencies in Washington is always a dangerous practice. Government officials should be content to set the rules by which industry must work and, at times, umpire industrial differences and disputes. But it is unfortunate when, as has often happened of late, these officials try to supplant experienced managerial judgment with official or political opinion. This fact must not be forgotten as the new technique of guiding industry is being developed by various agencies. This technique employs "advisory committee" meetings. The nominal purpose is to get advice from industry which is often necessary and desirable. But a few bureau chiefs or department heads are attempting to use the advisory committees for validation of official opinion which they seek to impose on business. Members of advisory committees can well see to it that they are not misused to the detriment of the public as well as the expense of their industry.

PROFESSIONAL DEFERMENTS are expected to continue under the new Selective Service regulations. Employers of professional workers can reasonably demand the same consideration for their research staffs as for those professionals more directly engaged in manufacturing essential materials for war or for the civilian economy. It is sometimes difficult for local boards to see the public value of research service. Managements must considerately but emphatically point this out since the replacement of skilled investigators is difficult at any time and almost impossible now. A young man who has spent four to eight years in specialized training at college and has a number of years of research experience in industry is more nearly irreplaceable than the most highly skilled artisan. Training of the latter may take months but training of research men takes years.

REORGANIZATION of the executive staffs of some of the corporations taken over by the Alien Property Custodian has greatly concerned non-partisan observers in Washington. Some see in recent appointments a mild and presently harmless political influence which has entered to replace the strictly technical managements first named by the Treasury Department. Others think that the Government plans to use these properties for promoting certain international policies that are not yet talked about except in the inner circles. Whatever the immediate motive or the ultimate plan, the situation will bear watching closely by all concerned with the preservation of private enterprise in the chemical industry.

SWEETENER SHORTAGE, already serious because of limited sugar supplies, will soon be worse for two reasons: The beet crop this year is barely 60 percent of normal and the beet sugar to be made will probably be even less relatively as beet molasses is diverted from sugar recovery to fermentation usage. The second important fact is the shortage of corn sweeteners which will inevitably follow the shortage of corn for wet grinding. Few have realized that nearly 20 percent of the sweetener used in food manufacture and in the household comes from corn. But when corn cannot be processed to make syrup or dextrose, the pinch is quickly felt.

MORE RAW SUGAR will come into the United States for refining during the next year than during the past twelve months. Taking this into consideration with the facts previously cited about the decline in beet sugar manufacture and the curtailment in dextrose production, it is evident that the pendulum of responsibility for carbohydrate supply swings widely from one to another of the chemical process industries.

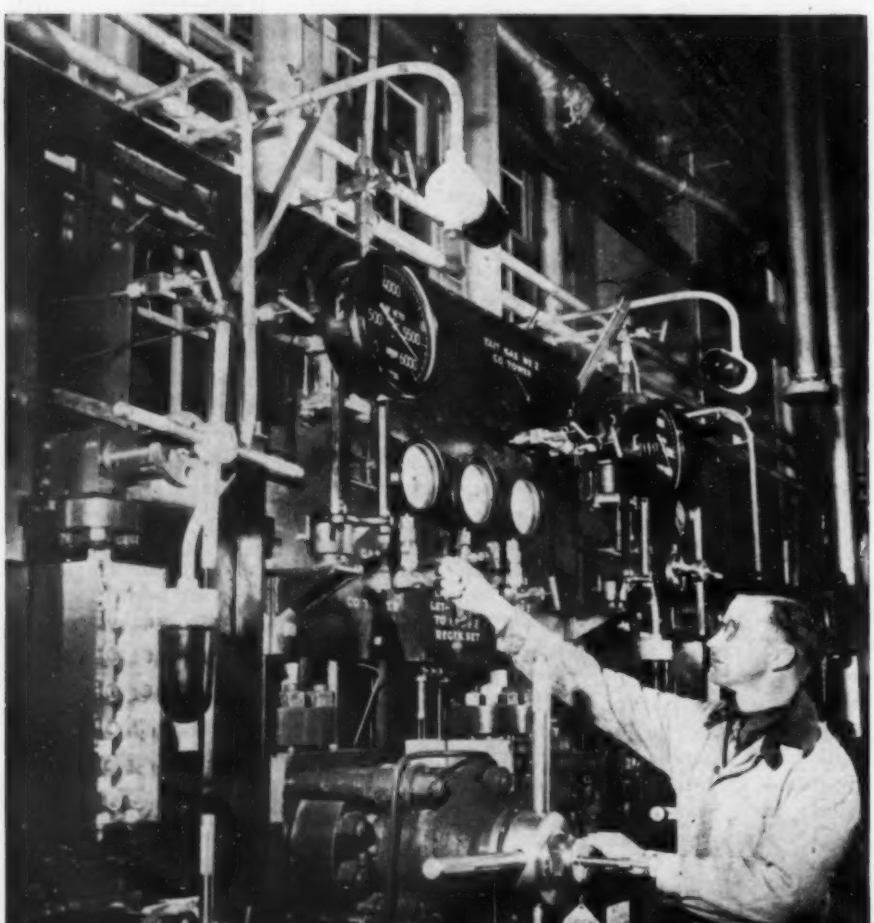
Canada Builds Chemical And Explosives Industries

JAMES MONTAGNES *Toronto, Canada*

Chem. & Met. INTERPRETATION

In the four years that Canada has been at war important chemical and explosives industries have been developed. Dollar value of products has jumped from two millions in 1939-40 to 121 millions last year. The chemical program has been expanded to supply needed materials to the United Kingdom, and intermediates and raw materials required by the Canadian explosives and chemical programs. The ammonia and ammonium nitrate plants were created to supply reserve capacity for Great Britain. This enlarged industry will have an immense value on the Dominion's future economic structure.—*Editors.*

Many of the new plants are large, more than one-half of them are major projects involving an expenditure of from $1,000,000 to $19,000,000. The government's Allied War Supplies Ltd. has under its control 40 different projects



When Canada went to war four years ago on September 10, it had but a small chemical industry and no explosives industry to speak of, having dismantled almost completely the first World War explosives plants. Wartime needs have rebuilt and vastly expanded the Dominion's chemical and explosives industries, primarily as a subsidiary to Great Britain's industry, but also to supply Canadian wartime needs and recently those of others of the United Nations. In 1939, the government's Dominion Bureau of Statistics reports, the chemical and allied industries produced materials valued at $159,500,000. Last year production amounted to $471,800,000.

"Our present production of chemicals and explosives is running at a rate of 10,000 tons a week," Canada's American-born Minister of Munitions and Supply, C. D. Howe, recently reported to Parliament at Ottawa. "The total quantity turned out to date (since start of the war) is in excess of 800,000 tons. One of these products is the most powerful explosive developed anywhere during the present war. The production of this valuable and secret explosive is being increased.

"The vast Canadian chemicals and explosives production is supervised by Allied War Supplies Ltd. This Crown (government-owned) company has under its control 40 different projects, 34 of which have come into operation. Total employment in these factories is in excess of 50,000 men and women. The various Canadian chemical and explosives projects under the administration of Allied War Supplies cover an area equal to that of the city of Montreal (the country's largest city with an area of 50 sq. mi.). Great Britain and the Allied Nations have relied heavily upon us for this (chemical and explosives) production".

To provide the deadly firepower required in modern warfare Canada has built, virtually from the grass up, a vast industry from whose plants pour a steady stream of explosives, chemicals and filled ammunition. Canada produced no filled ammunition during the first World War. The dollar value of chemicals and explosives produced and the ammunition filled in 1939-40 was only $2,000,000. In 1941, it climbed to $50,000,000. Last year production was more than doubled at $121,000,000.

While Canada scrapped the explosive plants built during the first World War, research in the Dominion did not slow down. When the present war started the country had the nucleus of trained chemists and engineers with whom to start chemicals and explo-

sives industries. This has required a capital outlay of over $140,000,000 since the war started. On one explosive project alone the capital expenditure was $18,000,000.

The explosives program has been developed mainly as a subsidiary and as a reserve against loss of production to the industry in Great Britain. At present Canadian capacity for the production of propellants and high explosives is nearly as large as that of Great Britain. Canadian requirements represent only a small portion of the country's production, with the balance going to the Allies.

The chemical program has been expanded to supply needed materials to the United Kingdom, and intermediates and raw materials required by the Canadian explosives and chemical programs. The ammonia and ammonium nitrate plants were created to supply reserve capacity for Great Britain.

To direct the operation of Canada's vast chemical and explosives program and to assure a steady flow of strategic materials to the plants, the Department of Munitions and Supply has established three individual agencies. The Explosives and Chemical Branch of the Department was formed to organize the production of chemicals and explosives; Allied War Supplies Corp., a Crown company, was incorporated to administer on behalf of the Canadian and British government the chemical and explosive plants which are owned and financed by the government; a chemicals controller was appointed to allocate chemicals for war purposes and to regulate the supply and distribution of chemicals in Canada.

The first large project undertaken in this program was for the output of TNT and cordite, and began operations in Ontario in the autumn of 1940. Others have followed in steady sequence across the Dominion. All these undertakings are sizeable, but more than one-half of them are major projects involving an expenditure of from $1,000,000 to $19,000,000. The fact that a single ammunition filling plant occupies 450 separate buildings scattered over an area of more than 5,000 acres gives an idea of the size of some of these projects. This plant operates its own railroad and fleet of trucks, provides living quarters for hundreds of employees, and has a recreational center, post office, hospital and hotel.

Several other projects are of similar size. Some are vast chemical works. Some are larger than a moderately sized city and employ thousands of men and women. One of these turns out five different types of explosives, three of which had never been made in Canada before.

The first large project in the expansion program was in Ontario. It began operations in the autumn of 1940. Others followed in steady sequence across the Dominion. Total employment is in excess of 50,000 men and women

Of the major projects of Allied War Supplies Corp., three are mammoth shell-filling plants, three are producing explosives, two are big fuse-filling undertakings, and the others are large chemical producers. This year two plants for large scale production of alkylate for high-octane aviation gasoline are scheduled to come into operation. Of the 15 smaller plants on the producing list of Allied War Supplies, ten are making chemicals, one manufactures fuse powders, and four are turning out or filling smoke bombs for greatly expanded overseas requirements during the past year.

The director-general of the Chemical and Explosives Production Branch of the Department of Munitions and Supply, J. E. Donald, recently stated in Montreal that the propellant required for use in rockets is being made in Canada's cordite plants originally designed for gun ammunition, and that a new explosive plant has been brought into operation recently producing a super-explosive by a process which originated in Canada and has been further developed by joint Canada-United States action. He stated that a chemical warfare plant has been established and is now ready for operation when required. A plant for manufacture of polyvinyl chloride has just been completed and Canada will shortly be making synthetic butanol. Largely increased production of calcium carbide has been undertaken. As a result of work at the Beloeil plant of Canadian Industries Ltd. the capacity of TNT plants with existing equipment has been doubled. Canada is erecting an isomerization unit for high-octane aviation fuel, the first plant of its type to be installed on this continent. A plant, for manufacturing anhydrous ammonia with natural gas as a basic raw material, produces ammonia at costs believed to be as low or lower than any other ammonia producer.

Canada's output of chemicals and

explosives in 1940 and 1941 was large and of outstanding value to the British Empire in the most critical years of its history. Production in 1942 was more than double that of 1941 and the year was marked by developments highly important to the United Nations. Among these advances was the replacement of cotton linters by wood pulp in nitrocellulose manufacture, making Canadian production of certain explosives independent of imported cotton linters, and increasing plant capacities. This has resulted from a joint Canada-United States effort. The work done is expected to be highly valuable in the future.

Whereas between 1914 and 1918 Canada was dependent upon imported Chile nitrates for the production of explosives, Canadian synthetic ammonia production now makes the country completely independent.

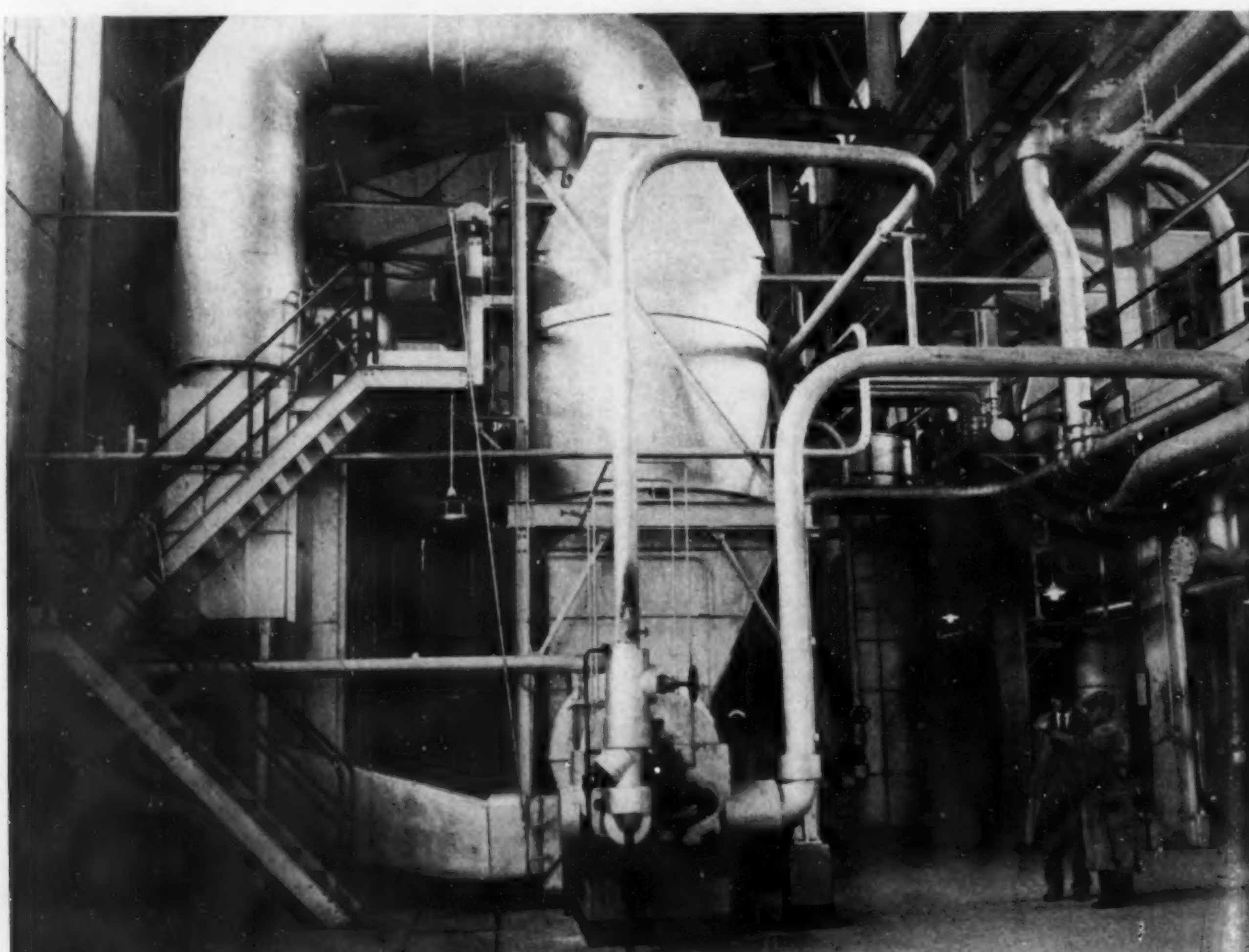
Considerable secrecy necessarily surrounds the chemicals and explosives program, but it has been officially stated that 12 types of chemicals and eight types of explosives are being made. Known products are cordite, TNT, smokeless powder, smoke screen chemicals, ammonia, sulphuric acid and alkylate.

Currently, some reduction in the manufacture of explosives and propellants is underway as the heavy ammunition program recedes from its peak due to decreased requirements. Canada, according to Minister Howe, is reducing its shell production to 25 types, some of which will be produced at a reduced rate from last year. There are nearly 50 plants making shells, scores of others making components including 12 types of fuses, 14 types of cartridge cases, two types of gaines, six kinds of primers, two types of depth charges, 10 types of trench mortar bombs, 70 different types of pyrotechnics, as well as practice bombs, anti-tank mines, rifle grenades. Production of heavy ammunition is now at the rate of 525,000 rounds a week. Small arms ammunition of 20 types is now made in Canada, being turned out at the rate of 25,000,000 rounds a week in plants and arsenals employing 30,000 people, one-half of whom are women. It is of interest to note that as ammunition production decreases this year, cartridge case manufacturing capacity thus released will be diverted to making additional cases for the United States.

A chemical development of interest is synthetic rubber. The government formed a Crown company in February, 1942, called Polymer Corp. Ltd., which is expected to go into production in September. This synthetic rubber plant was built in southwestern Ontario, and will place Canada on a self-supporting basis as far as rubber for essential needs is concerned. The products of the company are earmarked for war purposes. It is anticipated that annual capacity will be 10,000 short tons of styrene and 30,000 of butadiene. The main copolymer plant in which the butadiene and styrene will be synthethized into buna-S rubber, will have an annual capacity of about 34,000 long tons. Also, the plant will have a minimum annual capacity for the production of 7,000 short tons of butyl rubber.

New plants in Canada's chemical industry have been so set up that they would be of maximum value to the Canadian economic structure in post-war years.

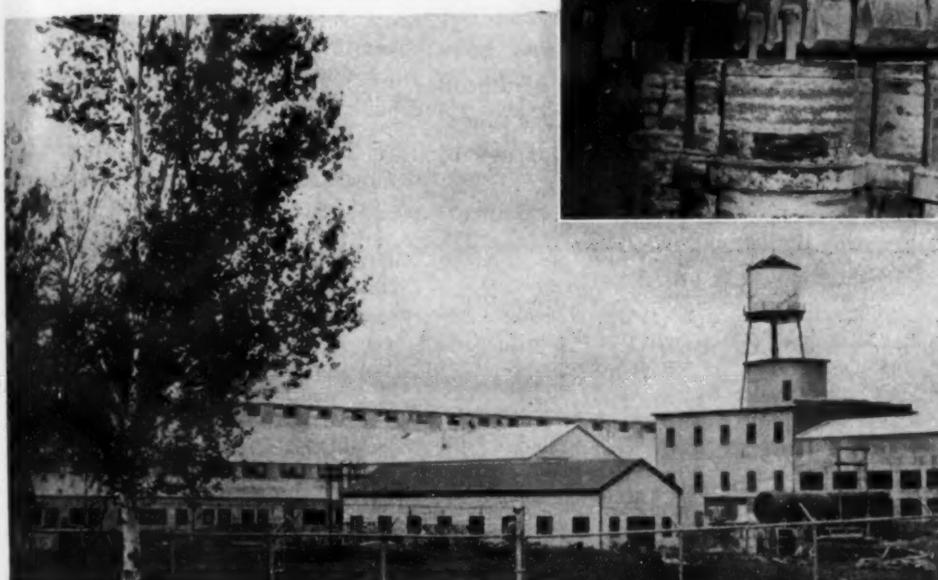
Alberta nitrogen plant. Canadian synthetic ammonia production now makes the country completely independent



Mg Made in Canada

At the Canadian Government plant of the Dominion Magnesium Co., near Renfrew, Ontario, the light metal is produced by the ferro-silicon process developed by L. M. Pidgeon. The first metal left the electric furnace in August, 1942.

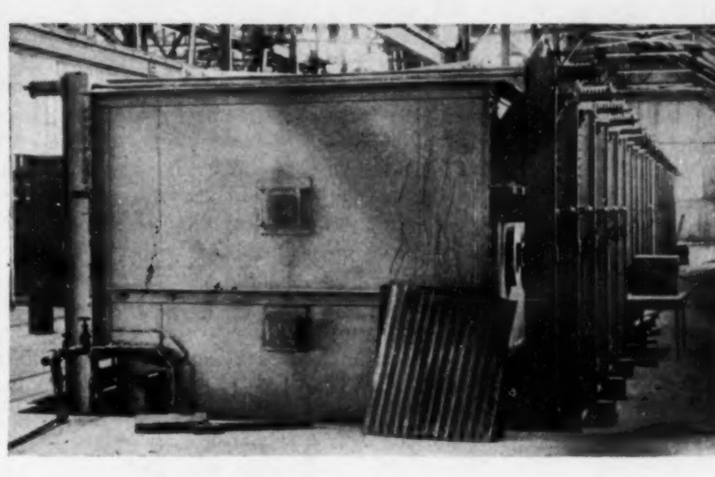
Like miniature grain elevators, these funnels load briquettes into canisters which carry them to pre-heating furnaces



Plant of the Dominion Magnesium Co. near Renfrew, Ontario. The metal, 99.98 percent pure, is recovered in a solid, dense, crystalline mass

Overhead conveyors transfer canisters from the pre-heating furnaces to the magnesium production furnaces

Canisters of briquettes are pushed into the pre-heating oven at the Renfrew plant of the Dominion Magnesium Co.



At the right may be seen the rears of magnesium furnaces. Each one contains a bank of retorts. Due to the ease of control and uniformity with which electric power can be converted into heat, electricity is the ideal method of heating

Britain Bounces Back

PAUL WOOTON *Washington Correspondent, Chemical & Metallurgical Engineering*

***Chem. & Met.* INTERPRETATION**

First-hand observations and interviews with leaders of the British Chemical industry prove that after four years of war's destruction, output of chemical munitions has greatly increased. This has been accomplished in spite of blackouts and bombings, widely scattered plants, lack of manpower and inadequate raw materials. Our correspondent sees permanent gains from war research and fuller use of chemical engineers in management and consultations.—*Editors.*

Performance during the war has won new recognition for the chemical industry of Great Britain. It has been brought home to government officials and to management generally that chemistry lies at the root of every other industry. The chemical industry is accorded the same priorities in securing supplies of materials and of labor that are allowed the manufacturers of shells and guns. The war effort has not been impeded by the lack of a single essential chemical product for which an order had been placed. This remarkable showing was made under the most adverse conditions. Neither workers nor management had an idea of what productivity could be until they had the stimulus of war close by. That gives rise to emotional impulses which increase productivity to an unbelievable extent.

Difficulties of operating plants under black-out conditions cannot be realized fully until they are actually experienced. There is not much complaining in England but most of that heard is about the blackout. Ventilation is a number-one problem, particularly in some chemical industries. Liberal use of exhaust fans and a special cowling were important factors in solving the problem. Special hoods had to be installed to handle fumes from certain processes.

New plants and additions to existing plants had to be laid out with a view to protection rather than to efficiency. Essential equipment had to be scattered. Even boiler plants were divided so that if one boiler were bombed another might escape. Thus power would be available for such parts of the plant that remained in commission. The chemical industry was fortunate in that it suffered relatively little damage from bombs. Early in the war the tendency was to put the new chemical plants in western England. Then the fall of France rendered that area vulnerable and new construction was confined as much as possible to the north. Subcontracting which has been resorted to generally from the beginning of the war was an automatic way of getting dispersal.

During the days when the Germans were bombing London frequently business was carried on under the greatest of difficulties. There were many interferences with telephone service. There were many instances in which, when the call was completed, it was found that the person called was dead. When a man went down to his office in the morning he never was sure the building still would be there. He might find that the subway trains would not be running or that his bus had to detour widely. Frequently it was an adventure to get to the office.

BOMBING EFFECTS

Much has been said of the effect of night bombing on workers. Executives and technical men were kept awake too. They also had to do duty as fire watchers. Despite all of these things they managed to increase production steadily. When a plant did suffer from war damage the fact was communicated to the workers in other plants making the same articles with the invariable result that the production of the undamaged plants went up enough to offset the loss. This resiliency of British industry was demonstrated again and again.

One large industrial town was bombed repeatedly but it continued to attract additional population. There was no tendency on the part of British workers to leave danger spots. Instead they flocked to them.

A spirit of cooperation pervades the entire British chemical industry. In the face of common danger each individual has tried to be helpful to others in the effort to step up production. Unselfish aid was given the competitor of yesterday. Panels of specialists were set up to visit plants to point out where efficiency might be increased or to take under study any problems for which the panel did not have an immediate suggestion. The fact that these panels were made up of technical men from competing companies made no difference. The panel was welcome everywhere it went and was allowed full access to processes and methods that in peace-time would have been closely guarded secrets.

Research has made great progress during the war. For the first time money has been available in large amounts for that purpose. More has been found out as to the properties of explosives during this war than in all preceding history. It took the war to prod the British government into compiling a register of scientists. Formerly most people were selected for scientific jobs on a basis of acquaintance; now there is a more scientific way to do it.

PERSONNEL ADJUSTMENT

One of the ways in which production was kept up in the chemical industries was in the use of women. Some 35 percent of the workers in those industries now are women. Management resisted the use of women as long as it was possible but now they are more than pleased with them. By breaking down skilled operations it has not been difficult to train women. Much more important than the training of women has been the training of chemists and technical personnel in branches of work outside their specialties. The adaptability of the British chemist is held by some to be one of the most significant accomplishments of the war.

British industries having incidental chemical problems are employing consultants as never before. Chemical engineers frequently are in attendance at meetings of boards of directors of companies engaged in businesses that seem far removed from chemistry. The government is using more consultants and is paying them better than before the war.

While Britain was inexcusably unprepared for this war in so far as materiel and equipment are concerned planning was much further advanced than was the case in 1914. A much higher percentage of the right people were in the right places from the very start.

Building the World's Largest Mills-Packard Acid Plant

ANDREW M. FAIRLIE *Consulting Chemical Engineer, Atlanta, Ga.*

Chem. & Met. INTERPRETATION

Rated at a capacity of 300 tons per day of sulphuric acid, on the 60 deg. Bé. basis, the new Mills-Packard acid plant of U. S. Phosphoric Products Division of the Tennessee Corp., erected near Tampa, Florida, is the largest plant of this kind in the world. From earlier descriptions by the author which have appeared in *Chem. & Met.*, it will be recalled that the chief characteristic of the Mills-Packard chamber which distinguishes it from the conventional box chamber is its truncated conical shape. Coupled with this is external water cooling of the chamber walls which permits the attainment of high reaction rates, and hence high capacity per unit of chamber volume.—*Editors.*

On the Fourth of July, 1942, the U. S. Phosphoric Products Division of Tennessee Corp. started operating the second unit of its new chamber-process sulphuric acid plant—the first unit having been completed and started in the preceding May. This two-unit plant—the largest Mills-Packard chamber plant ever built—has a rated capacity of 300 tons of 60 deg. Bé. acid (equivalent to 233 tons of 100 percent acid) per day. Ground had first been broken at the site of the new plant (some 11 miles southeast of Tampa, Florida) in December, 1941, and on account of the urgent need for acid for the production of triple superphosphate, construction work had been executed rapidly.

The plant, designed to operate on brimstone gas, is diagrammed in the layout shown in Fig. 1. Inspection of this plan shows that the plant is divided into two distinct units, from the sulphur burners, through the last chamber, and that just ahead of the Gay-Lussac towers the gases of the two units combine, then pass together through a single set of three Gay-Lussac towers, connected in series.

The main features of the plant include: four Glens Falls sulphur burners, each 4 ft. in diameter and 25 ft. long; four masonry combustion chambers; two radial-brick Glover towers of the Custodis double-walled type, each 14 ft. in diameter by 44 ft. high; two ammonia oxidation units designed to operate on ammonia liquor; six Pratt fans (four front and two rear fans); 20 watercooled lead chambers of the Mills-Packard frusto-conical type, each 50 ft. high, with top and bottom diameters, respectively, of 19 ft. and 27.5 ft.; and three Custodis-type double-walled masonry Gay-Lussac towers, all 47 ft. high and ranging in diameter from 13.5 to 16 ft. The minor, but no less essential features comprise the usual complement of acid tanks (top and bottom), acid pumps, acid coolers, water pumps (salt water for the acid coolers and fresh water for the chambers), ammonia-liquor storage tanks and pumps, and high-pressure pumps for chamber atomizer water supply.

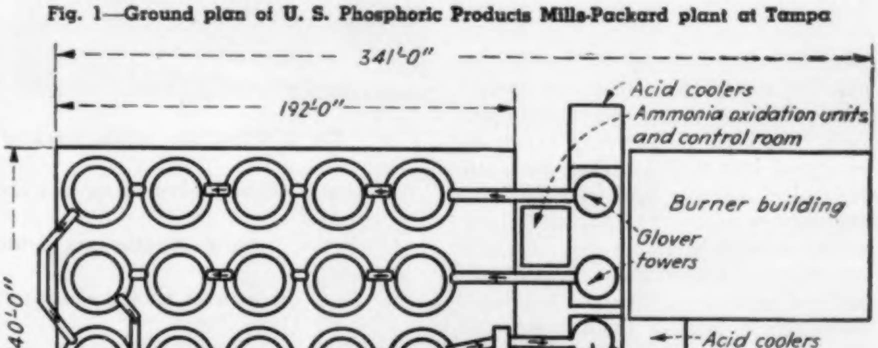
Fig. 2 depicts the uninviting plant site, with its scrub palms and clumps of tangled marsh grass, before breaking ground. Fig. 3 shows the chamber-erection tower (of wood), and within it the steel framework of the first Mills-Packard chamber to be erected; while in Fig. 4, leadburners are seen at work burning the seams of the first lead curtains. Fig. 5 exhibits the steel skeletons of five chambers, with the erection tower in place for a sixth. Lead sheets in place, for two of the chambers, are to be seen in Fig. 6, where the number of chamber framings in sight has increased to nine, and the rising masonry Glover towers appear at the left of the view. The number of lead chambers visible has grown to six in Fig. 7, and two partially completed gas flues of sheet lead appear above them. The view of Fig. 8 was taken on the same day as that of Fig. 7, but from a different point of view.

ROTARY BURNERS USED

Looking from left to right of Fig. 9, we come first to the sulphur bins, then to the Glens Falls sulphur burners, and then to the masonry combustion chambers, with the Gay-Lussac and Glover towers beyond. A close-up of two of the sulphur burners and combustion chambers is shown in Fig. 10.

The completed plant appears in Figs. 11, 12 and 13, showing in the foreground, respectively, the building

Fig. 1—Ground plan of U. S. Phosphoric Products Mills-Packard plant at Tampa



housing the sulphur burners and combustion chambers; the west side; and the east side, of the plant. The last mentioned view shows the cooling-water spray pond in front of the chambers.

The plant was designed and erected, under the direction of the writer, by the H. K. Ferguson Co., of Cleveland, Ohio. Sub-contractors on the job were the Custodis Construction Co. of New York City (who erected the five masonry towers) and the O. G. Kelley Co. of Boston, who handled the lead erection and the leadburning for the 20 chambers. Each chamber has a volume of approximately 22,000 cu. ft., with an aggregate of 440,000 cu. ft. of chamber space for the entire plant. At a daily production rate of 300 tons of 60 deg. Bé. acid, the plant was designed to operate at a rate of 2.75 cu. ft. of chamber space per pound per day of sulphur burned. Actually, the process has been operated at a smaller space-rate than that specified and the plant has not yet been crowded to its utmost capacity. The ground area covered by the platform supporting the 20 lead chambers is 26,880 sq. ft., and by the entire plant, 47,740 sq. ft. Texas brimstone is the raw sulphur material used, and the quantity consumed is approximately 80 tons daily. The sulphur is brought to the plant in railroad cars and is unloaded by crane and deposited on the storage pile at the north end of the plant. A "pay-loader" conveys the sulphur from the storage pile to a conveyor belt which cooperates with a system of elevators feeding the four sulphur bins at the feed end of the sulphur burners. From the bins the sulphur is discharged by gravity into the four hoppers attached to the burners, and is fed by worm feeders into the latter. The combustion chambers are equipped with automatic valves for regulating the intake of secondary air supply, controlled by Leeds & Northrup gas analyzers, and by this means the fluctuations in sulphur dioxide percentage in the gas entering the Glover towers are limited to a range of approximately 0.5 percent. The Glover tower top tanks are equipped with float switches, for automatically starting and stopping the acid-supply pumps, and also with pneumatic acid-level indicators, whereby the depth of acid in the top tanks may be read by the operator in the control room at the base of the towers. The Gay-Lussac towers are equipped with duplicate pumps, thus dispensing with top tanks for these towers. The quantity of acid in circulation over the towers amounts to about 1,200 tons per day, and a recovery of about 90 percent of the niter in circulation is effected.

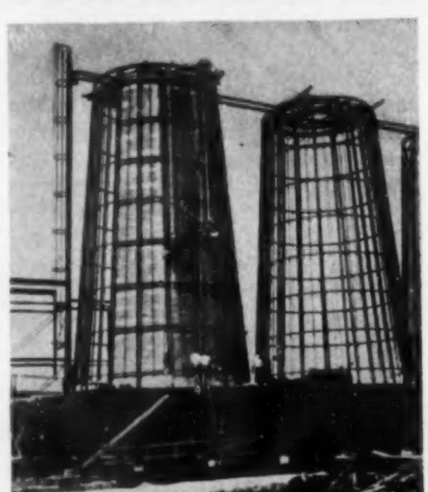


Fig. 2—Plant site before breaking ground, showing uninviting terrain

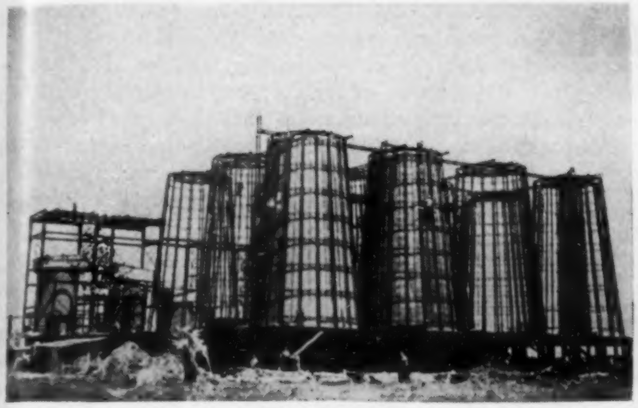
Fig. 3—Steel framework for first chamber within erection tower (Mar. 16)

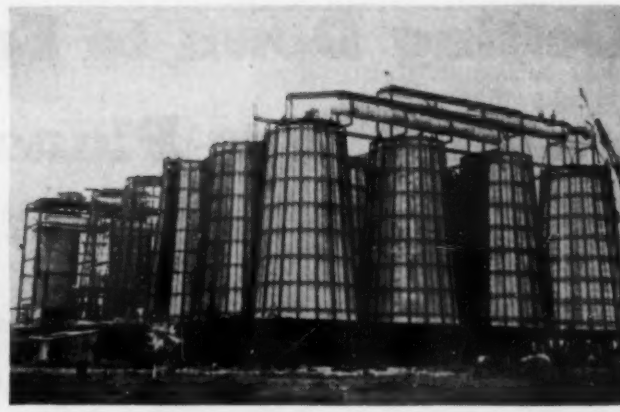
Fig. 4—Burning lead curtains of first chamber (Mar. 21)

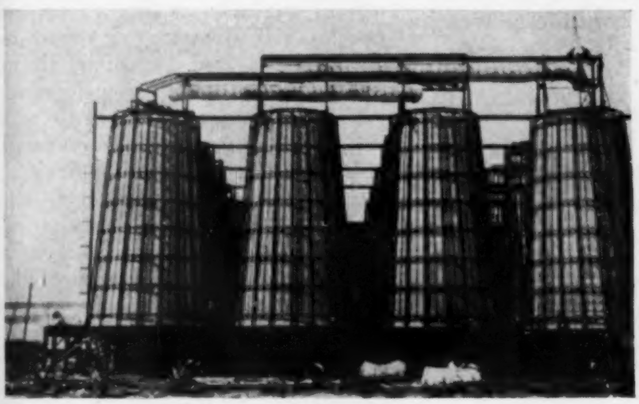
Fig. 5—Framework for five chambers completed, sixth being erected (Apr. 3)

This plant has maintained the reputation established for chamber plants of its type for low lead tonnage in construction, compactness, low chamber space and high acid yield per pound of sulphur burned per day, low operating and maintenance costs, wide range of production capacity and constant operating dependability. In fact, the records show not one day of non-operating time since July 4, 1942.

I wish to express my thanks to A. H. Case, vice-president and general manager of U. S. Phosphoric Products Division, Tennessee Corp., for permission to publish this paper.







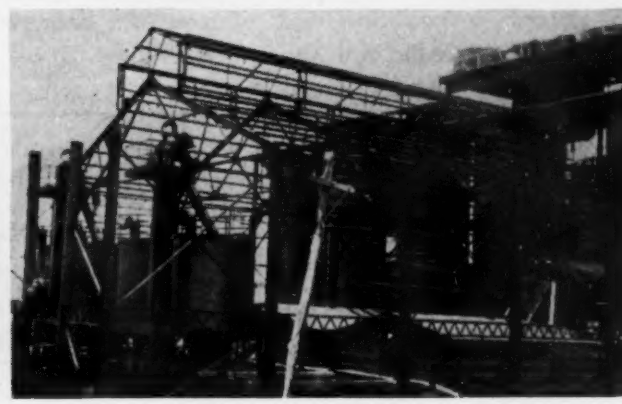


Fig. 6—Chambers and Glover towers show progress (Apr. 11)

Fig. 8—Another view on Apr. 23, showing tower progress

Fig. 7—Connecting flues partly completed (Apr. 23)

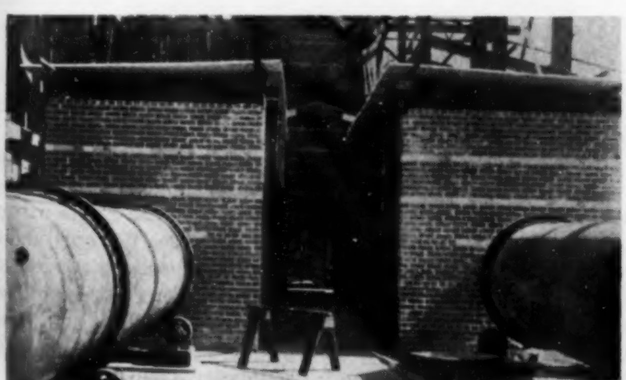
Fig. 9—Sulphur bins, burning equipment and towers (May 4)

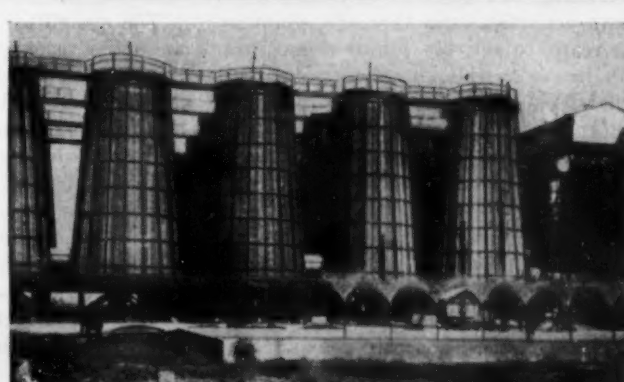
Fig. 10—Burners and combustion chambers completed (May 9)

Fig. 12—Completed plant from the west

Fig. 11—Plant in operation, looking south (July 4)

Fig. 13—Completed plant, and spray pond, from the east





Getting Down to Earth on Post War Plans

HAROLD E. THAYER *Mallinckrodt Chemical Works, St. Louis*

Chem. & Met. INTERPRETATION

The author presents a definite plan which might be used by the typical chemical manufacturing company when making its postwar plans or otherwise preparing itself to meet the changed conditions which will arise when the war has ended.—*Editors.*

A GREAT DEAL OF DISCUSSION concerning "postwar planning" is taking place and probably most everyone will agree that this is a subject worth considerable study. However, when an attempt is made to determine ways to arrive at wise postwar policies, it soon becomes apparent that there is nothing mysterious or entirely new about such planning as compared to ordinary business planning, war or no war. True enough, there will probably be more new conditions when the war ends than have ever existed at any one time before, but this will be the only real difference from any planning a company has regularly done in the past.

The purpose of this discussion is to suggest how the hypothetical Eagle Chemical Co. might start now to prepare itself to meet most successfully the changed conditions which will arise when the war has ended.

It is assumed that the Eagle company is an average chemical manufacturer, producing and distributing a large number of chemicals which are sold through various channels to numerous consuming industries. It is further assumed that the Eagle management believes in the importance of planning now for the company's postwar activities, and that the company is ready to actively follow this course. In line with this, it is suggested that the steps outlined below be considered.

At this early stage it is, of course, impossible to enumerate specifically all of the actual work which will have to be done to develop a suitable program. The people carrying on the developmental work will undoubtedly change, delete, and add to what is being suggested and adapt the suggestions to the peculiarities of any one company. Nevertheless, it is felt that the steps which have been outlined cover many of the important points and will serve to carry a program well into an active stage.

ESTABLISHMENT OF COMMITTEES

Because the successful completion of a postwar planning program is extremely important, it is suggested that the activities inaugurating the program originate with the board of directors. This body will establish a committee of three; one each from the production, research, and distribution departments.

The three people selected should not only be entirely familiar with the company's history as it pertains to their departments, but should also be thoroughly aware of all major current activities, and plans for changes that may be in existence now for their departments.

In addition to these three, the board of directors will appoint a chairman from one of their own members who has the entire management picture in mind. This committee of four will be entirely responsible for the development program. It is important that the committee have 100 percent support of the entire company, and be given the necessary authority to carry on the required work.

The committee of four will serve in an active consulting capacity to another group which will actually gather the necessary information needed to establish plans and policies. This procedure is suggested because the committee members, by nature of their current positions, will be so busy with day-to-day routine that they will not be able to devote the time personally to evolve the essential data needed.

This second group will consist of three members, one of whom will be chairman. They will actually gather the information to set up preliminary plans, which will be later considered by the first committee. All the members should be familiar, at least in general terms, with the production, research, and sales aspects of the business, as well as accounting procedures, and other related functions. It will be the function of the second group to gather data and present results to the major committee who will formulate objectives and determine policies.

These two groups must at all times not only keep in mind the inter-relationships of production, research, and distribution, but also how the following E.C.C. functions will be affected: personnel, purchasing, accounting, finance, etc.

STUDY OF CAPACITIES AND CAPABILITIES

I. As is the case with many chemical manufacturers the Eagle company's business is complex from the points of view of number of products manufactured, number of products sold, large number of industries served, and types of distribution. Unless the best possible direction is applied to the company's activities a dilution of effort may result whereby the most profitable business does not receive the major emphasis.

Consequently, the first step of these planning groups should be to carry on a thorough study of the Eagle organization to determine its outstanding capabilities and capacities, so that the best available resources can be utilized within the company. This study will be broken down under the following major headings: production, research and distribution.

It will include an historical analysis of these three departments. The most successful and the least successful work will be analyzed with the idea in mind that successful jobs might most easily be duplicated in the future because of past experience. The unsuccessful jobs will be studied to determine what corrective measures should be taken. The analysis will include the gross profit involved in work handled with a complete cost breakdown.

In all of this analytical work it is important that results be judged on

both the basis of current and long-time profitability and company strength. Consequently, it is not only essential that costs and statistics be considered, but also that attention be given to personnel performance, assignment of responsibility and authority, and general company organization.

PRODUCTION

A. A study of the production department should show, in general, the type of chemical manufacturing operations which the department is most capable of handling.

Specific steps to take in this will include:

1. Breakdown of existing manufacturing activities by products and departments.
2. Comparison of costs and gross profit dollars.
3. Analysis to determine which products, types of products, or product groups yield highest gross profit percentages, and gross profit dollars.
4. Correlation between high gross profit percent and type of manufacturing; i.e., vertical production from prime raw material or intermediates, volume of production, chemical purity of production, etc.
5. Correlation between high gross profit percent and customer classes E.C.C. serves.
6. Study of reasons for high cost by products, product groups, and departments; such as overhead, material cost, and labor cost.
7. Determination of which products contribute most to E.C.C. overhead costs.

These analyses will illustrate, at least on an historical basis, those manufacturing activities which have been most profitable to the company. However, here, as in all the studies proposed in this discussion, it must be borne in mind that what has been successful in the past, should not be the only basis for planning future activity. These studies will serve primarily as a preliminary basis for acceptance or rejection of existing and contemplated products in so far as the production problems are concerned. It must be appreciated that just because the company has not manufactured a certain type of product (which does not coincide with previous successful undertakings) that a proposed product should never be produced by E.C.C.

Attention is again called to the equally important analysis which should be made by all three departments of the comparatively intangible aspects of organization, lines of authority and responsibility within each department, and evaluation of personnel capacities.

RESEARCH

B. A study of the research department's activities as they have been handled in the past would point out those types of research in which the department has had experience. Also shown would be the extent of the contributions of the research division based on its ability to handle pure research, plant improvements, customer application problems, and the development of new products.

An analysis of the department's expenditures during the last five years would be made.

1. These expenditures would be divided on the basis of:
   - a. Pure research
   - b. Plant improvements
   - c. Customer application problems
   - d. Development of new products
     - i. New to Eagle
     - ii. New to industry
2. Comparison by groups in (1) to gross profit dollars and gross profit percent resulting from sales of products on which work has been done.
3. Further breakdown of (1) and (2) by products.
4. Comparison of (3) with E.C.C. customer groups.
5. Establishment of correlation between type of research department activity and profit-ability.
6. Relationship by years of (a), (b), (c), and (d) of (1).
7. Comparison of research department costs to E.C.C. sales with entire chemical industry's research costs to sales.

This study will show what the Eagle Chemical Co.'s research division has been doing, what it has done best, and where emphasis has been placed by customer groups. It must be remembered that the analyses of the research, production and distribution departments, point out only what has been done, and not what might or should be done.

DISTRIBUTION

C. Because the company distributes a large number of products to several distinct customer classes by selling direct to consumers, through jobbers and to various types of distributors, the marketing problems are extremely complex. It is important to obtain a complete picture of E.C.C.'s past sales.

In general, studying the distribution of the company's business will provide two types of information. The first will be an historical analysis showing, among other things, the relative importance to E.C.C. of the industries served, where the company sells its products, and which contribute the most sales and gross profit dollars. The second type of information will point out the trade acceptance, by industries, of the Eagle Chemical Co. as an institution, and also will include data showing percent of available business by products and industries which the company has.

To arrive at this information it is suggested that the following steps be taken:

Outline of suggested planning schedule for postwar studies

I. CAPACITIES AND CAPABILITIES STUDY
- A. PRODUCTION
  1. Breakdown of manufacturing activities
  2. Comparison of costs and gross profit dollars
  3. Determination of high gross profit groups
  4. Correlation between high gross profit percent and type of manufacturing
  5. Correlation between high gross profit and customer classes served
  6. Study of reasons for high cost of products
  7. Determination of which products contribute most to overhead
- B. RESEARCH
  1. Expenditures
     - a. Pure research
     - b. Plant improvements
     - c. Customer application problems
     - d. Development of new products
  2. Comparison of (1) with resulting profits
  3. Further breakdown of (1) and (2) by products
  4. Comparison of (3) with company customer group
  5. Correlation between activity and profitability
  6. Relationship of years of (a), (b), (c) and (d) of (1)
  7. Comparison of costs to company sales with ratio of entire industry's research costs to sales
- C. DISTRIBUTION
  1. Analysis of company business
     - a. Breakdown of sales by customer class
     - b. Breakdown of sales by E.C.C. territories
     - c. Gross profit analysis of (a) and (b)
     - d. Sales of major products by customer class
     - e. Arrangement of major products in order of decreasing importance
  2. Company's trade acceptance

II. FORMULATION OF OBJECTIVES
- A. Does company want more business
- B. How much more business can company expect
- C. Possibilities of increasing health of its products
- D. Which industries should company attempt to serve
  1. Current fields of distribution
     - a. Eagle's sales coverage by industries
     - b. Type of sales representative who may then serve the industries involved
     - c. Type of distribution to best cover industries served
     - d. Competitors' activities compared to Eagle's
     - e. Eagle's ability to render technical service
  2. New fields of distribution
     - a. Past sales inquiries
     - b. Recollections and impressions of research and sales staffs
     - c. Marketing field research
     - d. Development of contacts with public and private institutions
- E. Is postwar business to be derived from same industries

III. DEFINITION OF POLICY

1. An analysis be made of the company business by years, for the 1936–1942 period, showing,
   a. Breakdown of sales by customer class
   b. Breakdown of sales by E.C.C., territories by customer class
   c. Gross profit analyses of (a) and (b)
   d. Sales of major products by customer class
   e. Arrangement of major products in order of decreasing importance based on:
      i. Gross sales
      ii. Gross profit dollars
      iii. Gross profit percent

This will illustrate which products and customer groups are important to E.C.C., and consequently will point out where company emphasis should be exerted to make the most of its present day-to-day activities.

2. There are two methods which may be used to determine the Eagle company's trade acceptance; (one) determination by percent of potential business of products by industries E.C.C. has, and (two) investigation of the general attitude toward the company of industries served.

Since it is far easier for a company to market its products to industries where it has sales prestige than where it is an unknown supplier, steps should be taken to find out how various trades feel about E.C.C. as a source for their materials. This can be done through obtaining information from Eagle salesmen and marketing research, carried on either by E.C.C. or an outside firm.

Obviously there will only be an attempt made to develop these types of information for the major products the Eagle company distributes and the most important industries served.

Among many other findings, it will undoubtedly become clear from the analyses suggested above that Eagle not only has considerable trade prestige in one or two industries from which a large percentage of its business is derived, but also that the company has a high degree of trade acceptance in other industries where but a small part of the company's sales originate but where there may be a large potential volume of business. Conversely, the suggested analyses will point out those industries in which the company's prestige is not great and where it will probably be more difficult to sell the company's products.

FORMULATION OF OBJECTIVES

II. Before any reasonably definite plans can be set up to guide the company's activities, in so far as the postwar period is concerned, it is absolutely essential to determine as nearly as possible the objectives of the company. Objectives can only be set up on the basis of a great deal of information. The type of information it is important to have follows in the form of questions listed below, and under each question is a suggested means of how the information might be obtained on which to base these objectives.

A. Based on an increased amount of available business after the war, how much more business, if any, does the company desire compared to prewar sales?
   The answer to this question may be found in the attitude of the board of directors. If the board feels that the company should not attempt to secure any more business than it had in 1937 or 1938, for instance, the question is answered. However, it is reasonable to expect that the company can maintain its sales at the 1941 or 1942 level, and if this is the decision, the problem becomes one of where company emphasis should be placed to maintain business at the 1941 or 1942 volume.

B. How much more business can the company expect?
   The answer to this question is closely tied in with the second decision which the board of directors might make as listed under (A) above. The Bureau of Foreign and Domestic Commerce is actively engaged in gathering data to determine the amount of business that may exist in various industrial fields after the war. These data may in turn be applied to the industries which Eagle serves and compared to Eagle's sales to those industries during the prewar period. Assuming that the company has the products available, it is reasonable to expect that the E.C.C. business can increase in proportion to the increases estimated by the Bureau.
   This more or less theoretical approach may be supplemented by marketing research field surveys in which current and potential customers will be contacted to ascertain their postwar plans which will naturally have a direct bearing on sales plans projected by the company at that time.

C. Whether or not E.C.C. decides to increase its output, what are the possibilities of increasing the "health" of its products—(eliminating and adding products most advantageous from long-time viewpoint)?
   In so far as the elimination of products is concerned, an appreciable amount of data for this will be available from having developed information for (I) as a result of the analyses concerning the production and distribution departments of the company. Additional data will become available in (D 1) below.
   The matter of adding products which will be advantageous to Eagle from the long-time viewpoint is discussed below under (D), (D1), (D2), and (E).

D. Which industries should the company attempt to serve so as to have the best possibilities of future success according to its estimable sales volume record?
   This is probably the most complex, but most worthwhile study which will be made in connection with determining where the company's emphasis should be placed to maintain a strong position in the chemical industry. This part of the discussion has been broken down into two parts, (1) current fields of distribution, and (2) new fields of distribution.

   1. The analyses proposed under distribution of (I) appearing earlier in this discussion will help to answer this question. However, in addition to this, studies will have to be made concerning the following aspects of the problem: (Most of these data will be gathered through means of marketing field research).
      a. Eagle's sales coverage by industries
      b. Type of sales representative who may best serve the industries involved
      c. Type of distribution to best cover industries served
      d. Competitors' activities compared to Eagle's (sales, technical research)
      e. Eagle's ability to render technical service

   2. Information covering new possible industries which the company may serve and which they are not serving now can be developed in the following ways:
      a. Past sales inquiries

(*Continued on page* 110)

Formulating Fertilizers for 1943-44

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Chem. & Met. INTERPRETATION

Ammonium nitrate must be used more for fertilizer purposes this year than is normally desirable. This situation arises from the fact that this chemical is now available in considerable amounts, whereas the preferred ammonium sulphate and sodium nitrate are scarce for fertilizer purposes. Problems of hygroscopicity, caking in storage and methods of blending ammonium nitrate with other materials are discussed from the viewpoint of the fertilizer formulator.—*Editors.*

Formulation problems confronting the fertilizer industry arise from the necessity of using increased quantities of ammonia solutions and ammonium nitrate in the 1943–44 season. As far as the use of these products in mixed fertilizers is concerned, the problem can be considered under three headings: (1) use of greater quantities of ammonia solutions without excessive reversion of phosphoric acid; (2) storage and handling of solid ammonium nitrate in the fertilizer plant, and (3) formulation of fertilizers that are not too hygroscopic.

Ammonium nitrate is now available for fertilizer purposes from private and war plants. Increased supplies will be available in future years, for ammonium nitrate is the form of nitrogen which war plants produce that can be readily used in fertilizers. Its effective use is a problem the industry will face next year and in the years to follow.

AMMONIA SOLUTIONS

In 1941 the fertilizer industry used 65,000 tons nitrogen from ammonia solutions in the manufacture of complete fertilizers. More than 50 percent of the tonnage was used from November to February, whereas only 16 percent was used in the four summer months. It may be noted that in January, 1941, ammonia solution consumption was at the rate of 108,000 tons nitrogen per year.

Such problems as exist arise from the need for utilizing increased quantities of these solutions. The supply is subject to considerable variation, depending on the capacity of the industry to use the product, but a supply of 100,000 tons nitrogen is assured and this may be increased to 125,000 tons or more. It is easier to increase the production of ammonia solutions than that of any other nitrogen fertilizer material.

NITRATE STORAGE

Unfortunately, the first ammonium nitrate used in the eastern United States during the past season was in poor physical condition and was difficult to use in mixed fertilizers or for direct application. It should be remembered, however, that this product was not originally intended for fertilizer and no effort had been made to modify it for use as a fertilizer.

Tendency of ammonium nitrate to cake on storage is one of its objectionable properties. The fine crystals of Canadian ammonium nitrate formed a very hard cake and the use of limestone as a conditioning agent did not reduce caking. The use of kaolin or kieselguhr materially reduced caking. Granulation of the ammonium nitrate followed by coating with a good conditioning agent largely prevents caking in short-time experiments, but it remains to be determined how such products will hold up on prolonged storage under a variety of conditions.

Status of ammonium nitrate product improvement and production, as of June 18, is as follows:

1. Hercules Powder Co. is producing in California a finely grained ammonium nitrate with kieselguhr as the conditioning agent. The product does not cake readily and has been satisfactory for West Coast conditions.
2. One Canadian plant has modified its crystallization process so as to produce crystals that are 20-30 times as large as those formerly produced and shipped to the United States. Kieselguhr has been substituted for limestone as the conditioning agent. This plant is in full-scale production. Canadian plants have produced on a pilot plant scale three types of granular ammonium nitrate. The most promising process is granulation by spraying an ammonium nitrate melt. The resulting granules are then coated with kieselguhr or kaolin to prevent further caking.
3. T.V.A. has produced a coarse-grained ammonium nitrate containing 5 percent limestone. It is expected that this product will be improved by the use of an improved anti-caking agent such as kaolin.

Any of the foregoing materials are probably satisfactory for use in mixed fertilizers and the granular material from Canada and the T.V.A. product are quite satisfactory for direct application. None of the materials, however, have been subjected to long-time storage tests, so no assurance can be given as to the degree of caking that may be experienced on storage.

MOISTURE ABSORPTION

Absorption of moisture by fertilizer is influenced by at least three factors: (1) reactions between the components of the fertilizers; (2) hygroscopicity of the salt mixture; (3) quantity of hygroscopic materials present.

Ammonium nitrate reacts with muriate of potash in a fertilizer to form ammonium chloride and potassium ni-

Table I—Approximate Tonnage of Hygroscopic Materials Used in Mixed Fertilizers (Short Tons)

	1929	1941	1942–43	1943–44
Nitrate of soda	240,000	95,000	200,000	None
Ammonium nitrate	7,500	65,000	45,000	225,000
Urea	20,000	50,000	30,000	40,000
Potassium chloride[1]	280,000	46,000	110,000	115,000
Total	547,500	256,000	385,000	380,000

[1] From manure salts.

This article is a brief condensation by the editors of *Chem. & Met.* of a paper presented before the nineteenth annual convention of the National Fertilizer Association, June 21-23, 1943, at Hot Springs, Va.

trate. After the reaction, ammonium nitrate no longer exists in the fertilizer unless it is added in excess, namely, more than one pound of ammonium nitrate per pound of muriate of potash. Hygroscopic properties of the fertilizer, therefore, are influenced by the content of ammonium chloride and potassium nitrate, not by ammonium nitrate. A similar reaction takes place between ammonium nitrate and potassium sulphate. Data on the hygroscopicity of several combinations of fertilizer materials are given in Table II.

This table shows that potassium nitrate and mono-ammonium phosphate is the most hygroscopic salt pair that would be present in a fertilizer formulated with superphosphate, muriate of potash, ammonium sulphate, and ammonium nitrate. Addition of urea would give a slightly more hygroscopic mixture. On the other hand, use of an excess ammonium nitrate or sodium nitrate would give combinations with ammonium chloride having values of 51.4 and 51.9.

This also illustrates the importance of the reaction between ammonium nitrate and potassium chloride. Ammonium nitrate and urea form a very hygroscopic mixture. On the other hand, the most hygroscopic pair after the ammonium nitrate-potassium chloride reaction is ammonium chloride-urea. This explains the successful use of urea and ammonium nitrate in mixed fertilizers. Since urea and sodium nitrate are more hygroscopic, it explains why in a fertilizer containing a known quantity of urea it is better to derive an additional unit of nitrogen from ammonium nitrate than from sodium nitrate.

Third important point influencing moisture absorption by fertilizers is the quantity of hygroscopic materials present. A small quantity of material that will absorb moisture at a relative humidity of 50-60 percent can be used in most fertilizers but the amount cannot be increased too much without experiencing some difficulty. One advantage of ammonium nitrate and urea is that, due to their high plant-food content, the quantity added to secure one or two units of nitrogen is relatively small.

APPLICATION OF NITRATE

In view of the trade experience, the suggestions in the following paragraphs are offered to help in the use of ammonium nitrate in fertilizers containing 16-25 percent total plant food, 2-6 percent nitrogen, and 4-10 percent ash material.

1. The fertilizer formula should include 20-25 lb. of an active basic material per 1,000 lb. of superphosphate in order to neutralize the superphosphate. Hydrated lime, powdered cyanamid or neutralizing ammonia are good materials for this purpose. Dolomite is not very reactive and should be based with the superphosphate if used as the sole neutralizing agent.

2. In complete fertilizers formulated with superphosphate, ammonium sulphate and high-grade potash salts, use as much as two units of nitrogen from ammonium nitrate. Ammonium nitrate can be derived from nitrogen solutions, solid ammonium nitrate, or a combination of these sources. If nitrogen solution 2A or 3 is used it may be supplemented with about one unit of nitrogen from granular ammonium nitrate. On the other hand, if nitrogen solution 4 is used at the recommended rates of ammoniation, little if any additional ammonium nitrate can be used under average conditions.

3. In complete fertilizers formulated with superphosphate, urea-ammonia liquid-B, ammonium sulphate, and high-grade potash salts use up to one unit of nitrogen from granular ammonium nitrate.

4. If the fertilizer contains a substantial quantity of manure salts the combined quantity of ammonium nitrate and urea from solutions or solids should not exceed 60-80 lb. per ton. As far as possible, manure salts should be used in alkaline grades and low nitrogen-low potash mixtures.

5. Fertilizers containing ammonium nitrate and other hygroscopic materials should be formulated with as low a moisture content as possible. Avoid the use of wet dolomite, fillers, and conditioning agents.

6. If the fertilizer is shipped in moisture-proof bags, the indicated quantities of ammonium nitrate can be increased.

7. Ammonium nitrate can be based with superphosphate to make a 4 percent nitrogen base. If desired, ammonium sulphate may be included to make a 6 percent nitrogen base. Superphosphate should be well neutralized.

8. Modify the foregoing rules in accordance with local conditions of temperature, humidity, storage and trade requirements. Moisture absorption difficulties are greater in the warm weather of summer and early fall than in the winter and spring. Difficulties are greater along the South Atlantic and Gulf Coasts than in the Northeast. On the other hand, trade requirements for first-class physical properties are more exacting in the Midwest and Northeast than in the South.

Table II—Relative Humidity of Air in Equilibrium with Saturated Solutions of Salt Pairs at 30 deg. C.

	Ammonium chloride	Potassium nitrate	Urea
Potassium chloride	73.5	78.6	60.3
Ammonium sulphate	71.3	69.2	56.4
Monammonium phosphate	74.4	59.9	65.2
Monocalcium phosphate	73.9	87.8	65.1
Ammonium nitrate	51.4	59.9	18.1
Urea	57.9	65.2	72.5
Sodium chloride	68.8	66.9	52.8
Sodium nitrate	51.9	64.5	45.6

POSTWAR PLANS

(*Continued from page* 108)

b. Recollections and impressions of research and sales staffs

c. Marketing field research—contacting various industries where there may be a use for the company's current or contemplated products

d. Development of contacts with public and private research institutions

This would be done with the idea of ascertaining products which are adaptable to the facilities of the Eagle Chemical Co.

E. Should the company expect to derive its postwar business from the same industries in the same percentage as it did before the war? Material to answer this question will be developed on the basis of analyses made of the trend of the company's sales by customer classes during the past years, and also from the data collected to answer question (D) above.

From the factual information gathered in these studies, tempered with the backgrounds of experience available within the organization, it will be possible to formulate objectives which will point the way to maintaining and strengthening Eagle's position in the chemical industry.

DEFINITION OF POLICIES

III. After the company's objectives have been agreed upon, it is essential that suitable policies be set up for the purpose of translating the objectives into action. This step is the responsibility of the postwar planning group composed of one member from the board of directors and one representative from the production, the research, and the distribution departments.

Chemical Plant Construction Planned for 1943-1944

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Chem. & Met. INTERPRETATION

Thus far in the war period, direct spending for new plant construction for industrial chemicals has been from $30 to $40 million per quarter. We estimate that on July 1, about $120 million had been authorized but not completed. And nearly $150 million probably will be authorized during the present fiscal year. These huge expenditures indicate the importance of regular reconsideration of principles which govern wartime projects and postwar planning.—*Editors.*

Construction of chemical works during the next 12 months is likely to be as great as, possibly a little greater than, the comparable construction of the past year. This does not mean that there are going to be built many more huge factories like those for synthetic rubber, aviation gasoline, explosives, or the plants to make component chemical like alcohol, butadiene, toluene, or ammonia. But many industrial chemicals and related products of chemical process industries must be supplied soon in large quantities or the war effort will suffer and civilian supply be curtailed below safe levels.

Appraisal of this situation at this time is feasible without discussion of those military details which could not properly be published. And such appraisal is important because the planning done now may save both the taxpayer and the industry many millions that uncoordinated or thoughtless action would waste. However, it is important to note that the discussion of this article relates to a trend anticipated for the next twelve months. It is not the purpose to give any spot view nor to make estimates except in a most general way as an indication of the size of expected developments.

WHAT WE STILL NEED

The chemical industries are an essential part of almost every type of both military and civilian business. Wartime demands have now exhausted capacity for many chemicals of wide application. One might almost say that we need more of every chemical. That is not quite true, as anyone knows who has thought about surplus ammonia, just to name one example.

New construction is urgently needed to support the many activities which have grown steadily during the war and for which prewar capacity has thus far just managed to serve. Thus we now need more sulphuric acid, more superphosphate, more acetic acid, and more of a dozen other widely used chemicals. Many of these needs are the demands that have been created by diversion from peace to war service of old supplies. Many others represent growth in demand that will continue postwar. All represent fundamental and essential civilian requirements.

For at least two or three years after hostilities cease the United States is going to be the granary and the grocery store for the world. That job will last longer than the job of being "arsenal for democracy," because it will take several years for the rest of the world to reestablish its own food supply, especially its own food animals, even after released from dictator domination.

Plans for fertilizer chemicals are not merely for wartime demands. They represent also readjustment period needs of equal or greater importance. The spending of perhaps $25 million in the next 12 months for new capacity for phosphate rock, sulphuric acid, superphosphate, and other fertilizer chemicals has a great significance. The urgency of this spending is emphasized by the fact that in the fertilizer year 1943–1944 American agriculture alone needs 10 million tons of fertilizer, an all-time record demand.

Many who know of surplus explosives capacity have argued that we can merely divert sulphuric acid from that source to the making of superphosphate; but they have failed to look at the map and find out that the idle explosives plants are hundreds, in some cases many hundreds, of miles away from the South where superphosphate must be made. And it is not practical to build new fertilizer works near the idle explosives plants because we should then have to haul the phosphate rock from the South and the fertilizer material back to the South for use.

Fortunately there is no need for additional ammonia capacity. Far too much for comfort will be idle. But there is urgent need for facilities to convert liquid ammonia into usable fertilizer chemicals. We must make it into synthetic sodium nitrate or ammonium sulphate or other marketable product which can be mixed in fertilizers or used efficiently for separate application.

One of the unsolved problems of this fertilizer year is the attempt to use much ammonium nitrate. That chemical is a splendid fertilizer if one can get it into the ground in proper concentration. But even with the best methods of oiling which have been developed it is difficult to use either in mixtures or alone because of its caking characteristic.

NEW TEXTILE REQUIREMENTS

The war program has diverted many textiles and textile fabrics from normal channels. Thus far the general public has not suffered greatly because we were living off our accumulated fat. Huge stocks of fibers, fabrics, and garments were available all the way from primary sources clear through to the clothes closet or the dresser drawer. Now the stocks of this sort are nearing exhaustion at primary sources and the many levels of merchandising.

Some critics of the program for new plant construction argue that the civilian economy can do without. They base part of their argument on the theory that many producing units now serving military purposes will revert to civilian supply shortly. The latter argument is particularly insidious because it assumes both quick termination of hostilities and easy return of manufacturing enterprise to its prewar status. Both are dangerous assumptions.

Proponents of the new textile

chemical program are not thinking in terms of luxury goods. They are talking about necessities. In many cases they are talking about the making of chemicals as a prerequisite to mere substitute commodities such as rayon to take the place of silk.

It looks as though the estimates of $10 to $20 million of new chemical construction to serve these textile industries is very conservative. And it is not exaggeration to say that fully $5 million of this must be used for acetic acid alone. No well-informed person thinks that the postwar supply of acetic acid is likely to be excessive even with this large addition to capacity. Moreover, it will be a long time before silk moves again into American channels of trade; and until it does the demands for rayon, which mean the demands for acetic acid and other textile chemicals, are going to be greater than ever in prewar years.

AVIATION REQUIREMENTS

No single phase of the military program has grown or continues to grow with more startling demands than the air services. There seems to be no limit to the requirements for aviation chemicals, especially the chemicals to serve in making high-octane gasoline.

The problem of anti-knock for motor fuels is one that obviously is going to have postwar significance. The war has taken away from the average motorist all of the better quality gasoline. Millions of motorists are going to clamor for a better grade of gasoline at once when it can be supplied without detriment to military effort. Furthermore, the postwar trend in motor construction for both land and air vehicles will absorb all of the chemical supply which our most optimistic present effort can afford to provide.

Incidentally, it is important to note that making anti-knock components and high-octane motor fuel reaches far back into the chemical field with enlarged demands. These activities impose substantial burdens on alkali, acid, chlorine, and numerous other heavy chemical makers.

NEW CATALYTIC PROCESSES

The importance of catalysts and catalyst-base materials has taken on amazing proportions in the last few months. At several stages in the manufacturing of synthetic rubber and for the manufacture of high-octane gasoline the demand for silica-gel and for catalysts based on that material has exceeded all preceding demands many times over. It will not be surprising if at least $10 million of this year's spending will have to be placed in plants for catalysts alone.

This spending has an unusual significance for postwar, as well as unusual urgency in its military significance. Chemical engineering processes are in many industries entering a new stage as catalytic methods replace older slower techniques. In the postwar period the plant which uses the old method will have the advantage of having much of its capital written off. But the new processes are often so much more efficient in productivity per man employed or per thousand dollars of capital invested as to overcome that competitive disadvantage.

In developing new plants of this type it has become increasingly important for Washington to think of the postwar in another sense. Canadian authorities have done this for some time past. They have realized that the chemical industries are a growing part of their industrial economy. They have not sacrificed military service or wartime speed in order to get postwar usefulness. But they have always tried to increase the postwar value of new plants so that they may contribute most to the reversion to peace and the furnishing of postwar goods and services at low cost. Any country or any division of industry which has wholly forgotten postwar significance may be at great disadvantage when the postwar period arrives.

FOR PUBLIC HEALTH

New drugs, pharmaceuticals, and dietary aids have developed more in the past five years than in any previous period many times that length. New remedies or alternative methods for feeding or curing are now every day newspaper talk. Expansion of production facilities by the chemical industries must keep pace with this even in wartime. Perhaps one should say especially in wartime.

The estimates pending in chemical industries at the present time certainly aggregate $10 or $12 million for new manufacturing facilities for this class of goods alone. That is a lot of capital to invest in wartime when the small tonnage of the production is considered. But one needs to mention only four types of products of huge new demand in order to recognize that the sum is after all relatively small in comparison with the importance of the products. The four types especially notable are sulfa drugs, vitamins, quinine substitutes, and penicillin.

Incidentally, the manufacture of many of these drugs and pharmaceuticals reaches far back into the synthetic chemical field with new requirements for much more common chemicals. The impetus which will be given now and later to the whole synthetic chemical industry can hardly be measured by the few millions required for these ultra-urgent needs.

DIRECT MILITARY DEMANDS

No division of technology changes as rapidly as military engineering. Every division of air, land, and sea forces is constantly seeking something new and better both for offense and defense. Thus, demands which originate at the fighting front reach back into the chemical plant promptly with new chemical demands. We hear "hush-hush" discussions of new types of chemicals, new protective clothing, new explosives, and new military components of hundreds of kinds. It is not surprising that at any time there are pending in Washington $20 to $25 million of new construction requirements that originate thus in direct military services.

Some of these new products will have little postwar significance. But the components of those products are likely to become postwar staples. The impetus given to organic chemistry through the demand for toxic gases in World War I amply defends a comparable forecast for a new era of high explosive ingredients and the other military chemicals.

Creation of new demands often changes or reduces old requirements. Chemical firms have had two or three illustrations of this, some of them quite painful. Consider only the cutback in production of smokeless powder and high explosives which has been possible during the past six months or a year. Idle explosives plants and unused ammonia facilities are monuments to the abruptness of change in military plans.

They also illustrate the adaptability of chemical enterprise. The surplus ammonia will not all be absorbed at once; but it does suggest stupendous new manufacturing possibilities for postwar, and some for immediate application. The release of cotton linters and high-alpha cellulose pulp is having immediate benefits in other cellulose-using fields. The military themselves have picked up the surplus alcohol that is not needed for smokeless powder and are urging that it be made into synthetic rubber instead. The petroleum industry, relieved of some demands for toluene, is most happily applying the same facilities and materials for better aviation gasoline.

Comparable postwar readjustments will certainly come. There will be painful interludes and some huge idle facilities to remind us that war has demands that peace does not parallel.

(*Continued on page* 116)

New Approach to Continuous Reactor Design—III

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Chem. & Met. INTERPRETATION

In the two earlier articles of this series, the necessary mathematics was developed for a new theoretical approach to the design of continuous processing equipment for handling liquid-phase reactions as well as other combining and mixing operations. These methods permit the engineer to predetermine the performance of such equipment with a much higher degree of assurance than he could achieve by earlier methods. In the first article, in July, the authors derived the basic expression showing how long each portion of the effluent from a continuous liquid-phase system will remain in one or more vessels in series. The second article, in August, coupled this expression with the combining-velocity characteristics of various kinds of combining phenomena. The present article, which is the last of the series, takes an existing plant comprising ten identical reaction vessels, and for a typical reaction determines the capacity of the equipment when the vessels are operated, first batchwise, then continuously with four different arrangements of the vessels. The article also shows how for a constant throughput, the various arrangements contribute to the degree of completion of the reaction.—*Editors.*

ADVANTAGES of continuous operation in the chemical and process industries are well known, including the opportunity for greater output for the same equipment investment (or a closer approach to completion of the reaction); an equal output at a lesser investment; easier operation at lower operating cost; and generally a better and more uniform product. Often, however, the difficulties of designing accurately for continuous processing have thrown the choice to batch operation despite the preference for the first-mentioned method. A new mathematical approach to design for continuous processing in liquid-phase reactions and other combining systems is now available which facilitates and systematizes the necessary calculations, and at the same time permits the designer to estimate closely what the actual performance of the system chosen will be.

In the first two articles of this series (*Chem. & Met.*, July 1943, p. 111, and August 1943, p. 107) the mathematical basis for the new approach was presented and the necessary equations developed. The characteristics of certain types of reaction vessels were discussed, and nomographs and a tabulation were given which facilitate actual design. Methods of handling reactions which do not perform according to theory were also considered. It was shown that

$$S = \left(\frac{pe^{\lambda}}{1 - qe^{\lambda}}\right)^m \qquad (25)$$

where S is the mean completion of the combining phenomenon in a system comprising m vessels; $p = R/Q$, where R = the feed (or discharge) rate of the system in gallons per min. and Q = the circulating capacity of each individual mixer or reactor, also in gallons per min.; $q = (1 - p)$; e = the base of the natural logarithm system, 2.71828 +; and λ is a factor determined by the reaction velocity constant k; the minimum time a particle can remain in the system shown in Fig. 1 of the first article ($t_m = V/Q$, where V = the holding capacity of each vessel, in gallons); and by the initial concentrations of the reactants, a and b, in mols per liter for the case of a bimolecular reaction.

As an illustration of the application of the methods discussed in the first two articles, assume that an existing plant contains ten identical reaction vessels operating batchwise to carry out the following reaction:

$$A + B \longrightarrow C + D$$

The reaction follows the normal curve for a second-order reaction. The initial concentrations of A and B are 10 mols per liter and 5 mols per liter, respectively. The number of mols of A and B reacting in 3 hours is 4. Or, at the end of 3 hours the mol percent completion of reaction referred to reactant B is 80 percent. The time consumed in charging the vessels is 20 minutes. The discharging time is 10 minutes. The time required to bring the batch in each vessel up to reaction temperature by means of internal steam coils is 45 minutes; and no appreciable amount of reaction takes place prior to the time when the vessel's charge is brought to the final processing temperature.

Each vessel has a diameter of 4 ft. and a straight side vessel height of 6 ft. The holding capacity V of each vessel is 610 gal. However, the vessels are "worked" batchwise at 75 percent of their total holding capacity. Each vessel is equipped with a top-entering dual-propeller mixing assembly consisting of two 8-in. diameter x 14.5-in. mean-pitch three-bladed marine propellers, rotating at 1,125 r.p.m. The propellers are located one-quarter and half the way up from the vessel bottom, respectively.

In the first place, (1) what is the batch-operation capacity of the plant?

Then, (2) what is the increased continuous-operation capacity of the plant assuming the same percentage of completion for the reaction is desired, if: (*a*) The ten vessels are placed in series? (*b*) Two parallel systems of five vessels in series are used? (*c*) Five parallel systems of two vessels in series are used? and (*d*) Ten parallel systems of one vessel in series are used?

Finally, (3) assume that instead of an increased plant capacity for turning out 80 percent completely reacted material, a higher percentage of completion is desired for the plant's present productive capacity. It is hoped

that thereby costs of "working" a distillation for the recovery of unreacted A and B may be reduced or eliminated. To what extent can this be accomplished if the four vessel arrangements of Problem (2) are used?

Problem 1—The batch-operation capacity of the plant in gallons per min. can be found from the following considerations:

The total processing time per batch is the sum of the charging time, heating-up time, actual reaction time, and discharging time, or 20 min. + 45 min. + 3 hr. + 10 min. = 4.25 hr.

Where 610 gal. is the total holding capacity V of each vessel, the batch sizes run will be (0.75) (610) = 457.500 gal. (*Note*: To assure accuracy in the use of Equation (25) it is necessary to work to a considerable number of decimal places.)

Since ten vessels are employed, the batch-capacity of the plant will be (10) (457.5) ÷ (4.25) (60) = 17.9412 g.p.m. of 80-percent-completion material.

Problem 2—Assume that the design of each vessel is modified in accordance with Fig. 1 (July 1943, p. 112).

2*a*. Let the ten available and modified units be hooked up in series according to Fig. 8. The theoretical circulating capacity Q of the propeller mixers is, from the nomograph, Fig. 5, 475 c.f.m. However at 60 percent efficiency, the actual circulating capacity will be (0.60) (475) = 285 c.f.m. or 2,130 g.p.m.

The smallest length of time which a particle could spend in each vessel will be, from Equation (11), $t_m = V/Q = 610/2{,}130 = 0.286385$ min.

The reaction velocity constant k for a second-order reaction is

$$k = \frac{2.303}{t\,(a-b)} \log_{10} \frac{b\,(a-x)}{a\,(b-x)}$$

where a = initial concentration of reactant A in mols per liter; b = initial concentration of reactant B in mols per liter; and x = number of mols of A and B reacting in t minutes.

Therefore,

$$k = \frac{2.303}{180\,(10-5)} \log_{10} \frac{5\,(10-4)}{10\,(5-4)} = 0.001221$$

For a second-order reaction, according to Equation (17), $\lambda = t_m k(a-b)$ = (0.286385) (0.001221) (5) = 0.001748.

The quantities p and q are defined as $p = R/Q = R/2{,}130$, and $q = (1-p) = (1-R/2{,}130)$.

The desired mean completion S in the effluent from the given system is thus given as

$$S = \frac{b\,(a-x)}{a\,(b-x)} = \frac{5\,(10-4)}{10\,(5-4)} = 3$$

Since $m = 10$, and $p = R/2{,}130$, from Equation (25),

$$3 = \left(\frac{p\,e^{0.001748}}{1-(1-p)\,e^{0.001748}}\right)^{10}$$

and $p = 0.0172$. Therefore, R = (0.0172) (2,130) = 36.6 g.p.m. The percentage increase in plant capacity will be, therefore, (100) (36.6 − 17.9) ÷ 17.9 = 104.5 percent.

2*b*. Let the ten available and modified vessels be hooked up as shown in Fig. 9. In this system m will equal 5, since the system will consist of two tandems of five vessels in series. Hence, by Equation (25):

$$3 = \left(\frac{p\,e^{0.001748}}{1-(1-p)\,e^{0.001748}}\right)^{5}$$

and $p = 0.00895$. Therefore, R = (0.00895) (2,130) = 19.05 g.p.m. The plant capacity will be (2) (19.05) = 38.1 g.p.m. and the percentage increase in plant capacity will be, therefore, (100) (38.1 − 17.9) ÷ 17.9 = 113 percent.

2*c*. Let the ten available and modified vessels be hooked up as shown in Fig. 10. In this system m will equal 2, since the system will consist of five vessel tandems of two vessels in series. Hence, by Equation (25):

$$3 = \left(\frac{p\,e^{0.001748}}{1-(1-p)e^{0.001748}}\right)^{2}$$

and $p = 0.00416$. Therefore, R = (0.00416) (2,130) = 8.88 g.p.m. The plant capacity will be (5) (8.88) = 44.4 g.p.m. and the percentage increase in plant capacity will be, therefore, (100) (44.4 − 17.9) ÷ 17.9 = 148 percent.

2*d*. Let the ten available and modified vessels be hooked up as shown in Fig. 11. In this system m will equal 1, since the system will consist of 10 vessels in parallel. Hence, by Equation (25):

$$3 = \left(\frac{p\,e^{0.001748}}{1-(1-p)\,e^{0.001748}}\right)$$

and $p = 0.00263$. Therefore, R = (0.00263) (2,130) = 5.58 g.p.m. The plant capacity will be (10) (5.58) = 55.8 g.p.m. and the percentage increase in plant capacity will be, therefore, (100) (55.8 − 17.9) ÷ 17.9 = 212 percent.

Problem 3—The third problem mentioned above was to determine the increase in completion of the reaction that would result when the four continuous-flow arrangements were used, but with the 17.9412 g.p.m. throughput rate of Problem (1).

3*a*. Let the ten available and modified units be hooked up in series according to Fig. 8. Then the following data obtain: R = 17.9412 g.p.m.;

Figs. 8-11—Four arrangements of ten vessels used in text problems

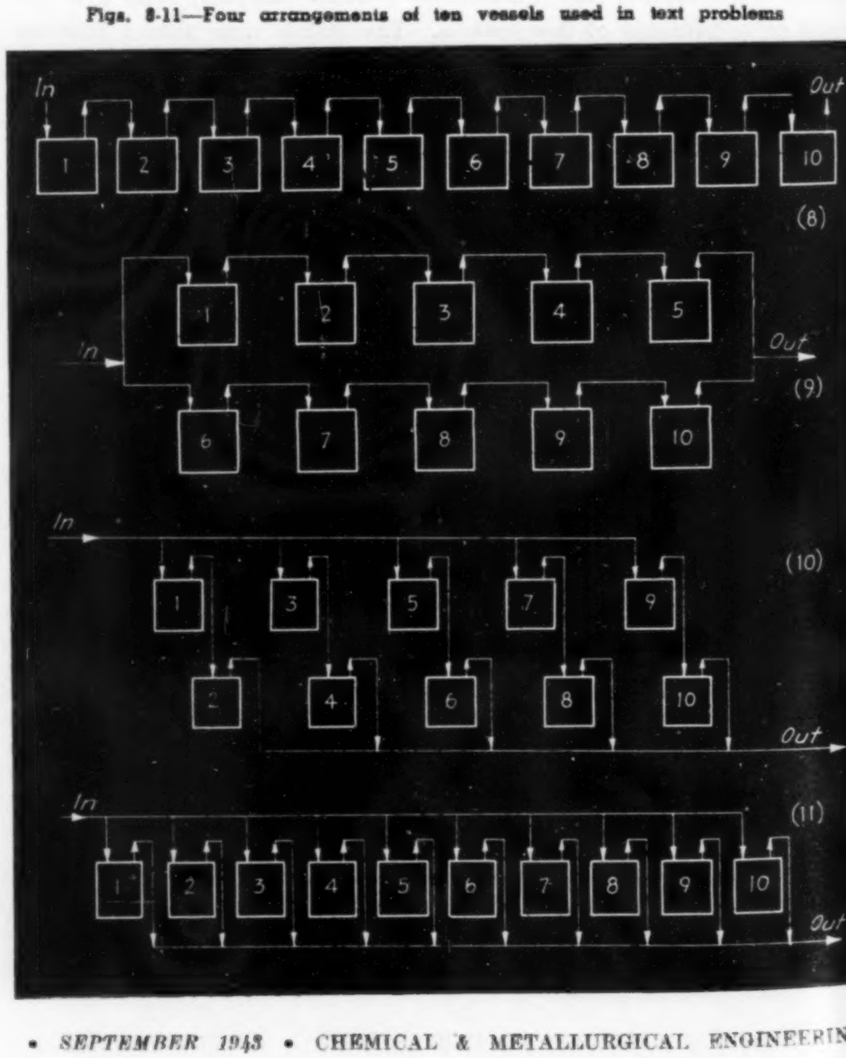

Table VII—Summary of Problem Results for Various Methods of Operation

	Hookup Employed				
	10 Vessels Batchwise	10 Vessels in Series	Two Tandems of 5 Vessels in Series	Five Tandems of 2 Vessels in Series	10 Vessels in Parallel
Plant capacity with 80 percent reaction completion, g.p.m.	17.9	36.6	38.1	44.4	55.8
Percent capacity increase at 80 percent reaction completion with continuous instead of batch operation	....	104.5	113.0	148.0	212.0
Percent completion of reaction with continuous operation while running at batch capacity of 17.9 g.p.m.	80.0	95.0	96.4	99.999	....
Standard mean deviation from mean holding time of 340 min. at throughput rate of 17.9 g.p.m.	....	107.8	152.5	241.0	....

Q = 2,130 g.p.m.: $k \doteq 0.001221$; $t_m = 0.286385$ min.; $\lambda = 0.001748$; $p = \frac{R}{Q} = \frac{17.9412}{2,130} = 0.008423$; $q = 1 - p = 1 - 0.008423 = 0.991577$; and $m = 10$. Then:

$$\frac{5\,(10 - x)}{10\,(5 - x)} = \left(\frac{0.008423\, e^{0.001748}}{1 - 0.991577\, e^{0.001748}}\right)^{10}$$

and $x = 4.74278$ mols. The percentage completion achieved for the throughput would be (100) (4.74278) ÷ 5 = 94.86 percent.

3*b*. Let the ten available and modified units be hooked up according to Fig. 9, consisting of two tandems of five vessels in series. Then the following changes in the data obtain: $R = 17.9412/2 = 8.9706$; $p = 8.9706/2{,}130 = 0.004212$; $q = 1 - 0.004212 = 0.995788$; and $m = 5$. Then:

$$\frac{5\,(10 - x)}{10\,(5 - x)} = \left(\frac{0.004212\, e^{0.001748}}{1 - 0.995788\, e^{0.001748}}\right)^{5}$$

and $x = 4.82239$ mols. The percent completion achieved for the throughput will be (100) (4.82230) ÷ 5 = 96.45 percent.

3*c*. Let the ten available and modified units be hooked up according to Fig. 10, consisting of five tandems of two vessels in series. Then the following changes in the data obtain: $R = 17.9412/5 = 3.58824$; $p = 3.58824/2{,}130 = 0.001685$; $q = 1 - 0.001685 = 0.998315$; and $m = 2$. Then:

$$\frac{5\,(10 - x)}{10\,(5 - x)} = \left(\frac{0.001685\, e^{0.001748}}{1 - 0.998315\, e^{0.001748}}\right)^{2}$$

and $x = 4.99999$ mols. The percentage completion achieved for the throughput will be (100) (4.99999) ÷ 5 = 99.999 percent.

3*d*. Let the ten available and modified vessels be hooked up as shown in Fig. 11, consisting of ten vessels in parallel. Then the following changes in the data obtain: $R = 17.9412/10 = 1.79412$; $p = 1.79412/2{,}130 = 0.0008423$; $q = 1 - 0.0008423 = 0.999158$; and $m = 1$.

Computation in this instance results in a value for qe^{λ} greater than unity. The development of Equation (25) and the conditions imposed upon it by Equation (28) indicate that the application of Equation (25) to this computation would not yield a meaningful value for S. What is the physical interpretation of this condition? Briefly, the establishment of an R such that qe^{λ} is greater than unity means that a condition will be set up in the vessel such that the products of the reaction constitute too great a source of dilution for the incoming reactants to make "contact". Indeed, a state of "infinite dilution" of the reactants in the products of the reaction would thus have been achieved.

A study of the tabulated results of these problems, shown in Table VII, is fruitful in developing an appreciation of the significance of the results and in developing thereby a means of selecting the optimum arrangement of the given equipment.

It is apparent that either of the two sets of values computed in Problems (2) and (3) may be used to estimate the comparative efficiency of each of the given arrangements. That is, either (1) The maximum throughput rate which may be employed in each arrangement to yield an identical completion of reaction in the effluent; or (2) The completion of reaction characterizing the effluent in each arrangement under an identical throughput rate in each case constitute thoroughly interchangeable criteria of efficiency. Therefore, it should be noted that the remarks which are made below in explanation of the results shown in Row (1) of Table VII reflect equally upon results in Row (3).

Brothman found that, for all values of numbers of vessels in series, the expression for the "standard mean deviation" from the mean holding-time equals $(t_m/p)\sqrt{mq}$. The values of the "standard mean deviation", computed accordingly, for the case of the identical throughout rate of 17.9 g.p.m. are given in Row (4) of Table VII. The fact that the extent of completion of the reaction, for the given case, tends to increase as the "standard mean deviation" increases, gives the clue to the explanation of the results and provides us furthermore with a criterion for making the final selection of the arrangement to be used.

Drawing an analogy between the significance of the "standard mean deviation" from the mean holding-time in the case of continuous combining equipment, and the role assumed by the "standard mean deviation" in the field of statistics, it may be observed that in both cases the greater the "standard mean deviation" from the mean, the less efficient or "competent" is the mean in estimating any phenomenon or event which is related to the mean.

Therefore, where for the case of batchwise combining operations the "standard mean deviation" from a given holding-time is virtually zero, the mean holding-time within the system precisely determines the completion of the combining phenomenon according to the statement that the completion of the combining phenomenon is a function of time. On the other hand, it stands to reason that where the "standard mean deviation" from the mean holding-time increases, the deviation as to completion (as referred to that which would be expected on the basis of the mean holding-time alone) should also increase. The deviation in the positive direction which characterizes the completions yielded upon increase in "the standard mean deviation" in the given example follows from (*a*) The logarithmic or exponential nature of the completion-vs.-time curve obtaining for the given combining phenomenon; and (*b*) The dispersion of significant values of P (the proportions of the discharge for various retention times) with respect to time obtaining in each case.

Now, in what manner could the magnitude of the "standard mean deviation" from the mean holding-time conceivably affect the decision as to which arrangement should be used? To answer this question involves pressing home the fact that a large "standard mean deviation" from a mean indicates in our case a wide dispersion of significant values of P on both sides of the mean; while a small "standard mean deviation" from the mean indicates a "bunching" or narrowing of the significant values of P within a limited band about the mean. In reactions where, as in the cases of many organic syntheses, the prolonged retention of a reaction product within a system in contact with the reactants tends to promote side-reactions, arrangements involving large "stand-

ard mean deviations" would not be acceptable.

Again, let us suppose that the reaction involved, first, the building up of a "chemical condensation" product or monomer, and secondarily, a polymerization. Furthermore, let us suppose that the object of the polymerization is a product having a special spatial structure and that the various polymerization operations are responsive to the quantitative relationships existing between the products of the various stages of the polymerization. In such an instance, the continuous system would have to guarantee not only a required completion with respect to the chemical condensation or monomer product, but also a minimum deviation in the effluent from a given mean holding-time. Therefore, the arrangement tending to limit the "standard mean deviation" to its minimum limits, namely the ten-in-series system, would be virtually mandatory. As a matter of fact, it might well be that the goal of restricting the "standard mean deviation" would not only force the use of a ten-in-series arrangement, but could furthermore make necessary a stepping-up of the rate of throughput at the expense of the obtained completion of reaction as a means of sharply restricting the "standard mean deviation".

In this connection, it might be well to point out that Brothman's work has indicated that approximations as to the precise proportions of materials passing from a continuous combining system within set deviations from the mean holding-time may be obtained by the use of well-known theorems taken from the field of mathematical probability. A useful theorem in this connection is that of Bienayme-Tchebycheff. The proper coordination of such theorems with the mathematics used to derive the basic formulas used here is good and proper, since the branch of mathematics used here is isomorphic with the field of probability.

There are, of course, other considerations which might influence the decision as to which arrangement should be used. These might include: (*a*) The complexity of the piping and control system required to assure a uniform rate and quality of feed to a parallel system involving a large number of units; (*b*) The capacity of the equipment comprising the subsequent stages of a continuous hookup; and (*c*) The economical considerations involved; etc. In a word, the designing of continuous plants involves the consideration and skillful interpenetration of a host of factors, many of which may be peculiar to the particular problem at hand.

CONSTRUCTION

(*Continued from page* 112)

But adaptation of capacity to peace uses is expected, greatly to the comfort of taxpayers whose money would otherwise have been dissipated without postwar usefulness.

WE CAN BUILD NOW

Huge construction demands for camps, for explosives plants, for arsenals, and for other like war services are largely at an end. Donald Nelson has said that the war construction program was more than 80 percent complete at the end of June. There have thus been released primary construction facilities and personnel which make present new demands for chemical construction much simpler and more favorable for approval. However, it is recognized that a major problem today is one of manpower. If these construction workers can be transferred to manufacturing service instead of continuing in construction work, they will to that extent relieve the present serious production problem. However, they are readily most adaptable to construction jobs and will be used there quite readily when needed.

It is clearly evident in all discussions at W.P.B. that the rock bottom level of essential civilian supply must be closely approached in any line of business before new supply facilities will be authorized. That is a proper requirement. However the civilian supply officials of W.P.B. are wisely pointing out that it takes a long time to get ready to make new clothing, to prepare essential housing materials, and to make the chemicals for the fertilizers for the food supply of next year. Thus, present construction of chemical works must be viewed from the standpoint of 1944 and 1945 demands.

Another factor is being emphasized by those who recognize what lies back of civilian employment. These officials point out that the civilian work continues to produce for the Army with full effectiveness only when workers are reasonably supplied with all the essentials and a few of the comforts of civilian living. It is not safe to get down too close to the irreducible minimum. To do so hurts the Army even more than it hurts the civilian. But naturally these broad principles, easy to state, are not easy to apply when appraising the reasonableness of a request for new capital expenditures in chemical works.

In another particular Army and civilian agencies sometimes have a bit of conflict. This relates to the allocation or diversion of chemicals from plants now in operation. One thing that civilian users and civilian operators occasionally forget is that these plants may suddenly have to be turned back to a military job even though their main task over the next year or two will be civilian supply. It is important that the "readiness to serve" aspect of operation be maintained in plants that have two possible uses. Customers of such plants having a civilian interest must also stand ready to do without if military requirement suddenly develops.

WHAT IS SCARCE AND WHERE?

Perhaps the ultimate test governing approvals of new chemical construction will be two lists of scarcities. The one list indicates raw materials which we still must conserve with the greatest of care. The other itemizes those component parts of equipment and machinery for which production facilities continue to be very inadequate. Naturally, new large uses for styrene, acrylonitrile, or butadiene will not be considered as reasonable as long as the synthetic rubber program must grow weekly and monthly to huge proportions. Equally certain is a high hurdle in the way of any man who wants heavy forgings for reaction vessels or high-pressure pumps, or the other types of equipment which are of vital need for ship building and for the development of military equipment of other sorts. This means that some less effective or less efficient methods of manufacture must sometimes be chosen instead of preferred procedures. At that point the skill and ingenuity of the chemical engineer is important for adaptation of secondary methods through "makeshift" engineering.

Equally important in presenting or prosecuting plans for new chemical facilities is the question of plant location. Scarce-labor localities must be avoided at all cost. This often is a serious matter. However, there are many circumstances under which new construction has to be requested and must be granted for areas known to involve labor difficulty. This is true when new units or new types of manufacture must be associated with present going plants in such localities. Fortunately, the labor requirement for the vast majority of chemical enterprises is small when judged in terms of manpower required per million dollars invested. Thus, location factors which might be dominant in industries of high labor use becomes less important for chemical enterprise.

COMBINATION ACID–ALKALINE TREATMENT SPEEDS CLEANING OF CLOGGED FILTER SCREENS

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In the sugar industry the use of Monel metal and stainless steel wire screens with diatomaceous filter aids as a filter medium has been found to result in a progressive loss in filtering capacity through the clogging of the screen openings with fine particles of the filter aid, as shown in Fig. 1. These particles are cemented into place with gums, resins and colloidal impurities which are brought into the process with the raw sugar. It is quite probable that similar troubles may be encountered in other industries using similar filtering methods and that the new method for cleaning the screens which has been developed by the Pennsylvania Sugar Co. may be equally useful outside the sugar industry.

In the case of the Vallez rotating-leaf filters used so generally in sugar refining, the clogging becomes exaggerated at the hubs of the leaves, under the rims at the perimeter and at any blind spots which cannot be reached by the flushing nozzles. Furthermore, the flushing itself tends to wedge particles into the interstices of the screens with increasing firmness. The clogging takes place more rapidly in filtering low purity affination syrups which include a large percentage of impurities flushed from the surfaces of the raw sugar crystals and held in suspension.

When the capacity of the filters is reduced to the point where the required production is threatened, the screens must be cleaned. The acceptable reduction in capacity might, for example, be about 30 percent, depending on the size of the installation and the demand for output. With high purity syrups the cycle between cleaning and overhaul is longest, and least for low purity syrups. It is claimed that the use of clarified syrups in the precoating of the filter leaves will increase the time between cleanings. The composition of material removed from the screens appears to support the theory of cementing action. An average sample of the deposit consists of organic matter, 20 percent; silica, 37 percent; iron phosphate, 16 percent; calcium phosphate, 18 percent; and a trace of magnesium phosphate.

Usual cleaning practice starts with the time-consuming practice of dismantling the filter elements, after which the leaves are placed in a tub and boiled first in an alkali solution and then in dilute muriatic acid. This treatment softens the deposit which is then dislodged with a strong jet of water. Some refineries use a blast of fine sand and at least one uses sharp, fine-grained sugar instead of sand. Sometimes scrubbing with hydrofluoric acid has been used to facilitate the removal of the silica. All of these methods are slow and laborious.

Trial-and-error research has shown the strange fact that reversing the older practice of applying the alkali bath first, and instead treating the screens first with acid, and then with alkali, is much more effective in promptly removing the deposit. The improved tub procedure therefore has been changed to a soaking in a 2 to 5 percent solution (by volume) of commercial muriatic acid*, followed by a water rinse and a hot bath for a few minutes in a solution of 2 to 5 percent caustic soda (by weight), which dissolves the deposit completely. About one-half hour's acid treatment is needed for the 5 percent acid, and about one hour for the 2 percent acid. As an inhibitor for the acid treatment, 2 to 3 percent (by volume) of 80 deg. Brix refinery molasses is added.

In case repair of the screens is not needed, their cleaning by the new method can be accomplished without removal from the filter body, another important time-saving feature. In this case the filter is charged with a 2½ percent inhibited muriatic acid at room temperature up to the level of the bottom of the hubs. After the element has been rotated for an hour, the filter is drained and then rinsed with water. This is followed by treatment with 2½ percent caustic solution which is kept hot with steam while the filter is rotated for half an hour. After a final water rinse the filter is ready to return to service. Because of the economy of this treatment in time and labor, it can be applied more frequently and so postpone the inevitable and costly dismantling for thorough cleaning and repair. The increase in capacity of the filter that follows cleaning indicates that the improved cleaning procedure is effective.

The new method employs cold acid instead of hot, and so results in less corrosion of the filter parts. In addition, the use of refinery molasses as an inhibitor reduces the corrosion of cast iron by 40 percent. Furthermore, refinery molasses costs considerably less than the commercial inhibitors formerly used. The inhibitor protects the cast iron, steel and stainless steel parts, but no inhibitor has come to our notice which is

* This is not 2 to 5 percent HCl, but 2 to 5 percent by volume of commercial muriatic of 31.45 percent HCl. Mr. Dittmar points out that some confusion on this point was encountered by readers of his earlier article (Feb. 1943, p. 137) on the cleaning of fouled heat transfer surfaces, where the 3 to 5 percent HCl solution referred to was similarly 3 to 5 percent of commercial muriatic.

Fig. 1—Clogged Monel filter screen, with part cleaned

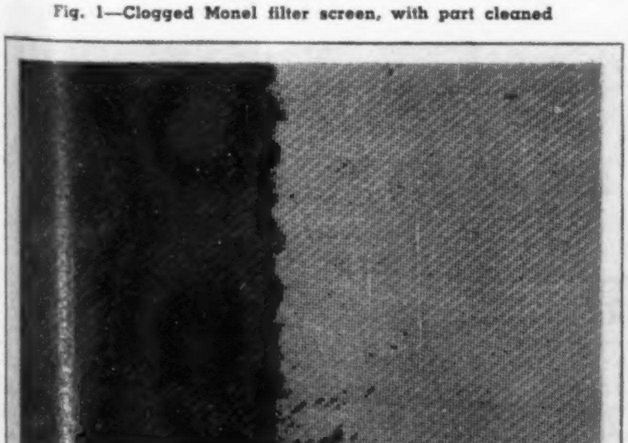


Fig. 2—Vallez filters in Pennsylvania Sugar refinery

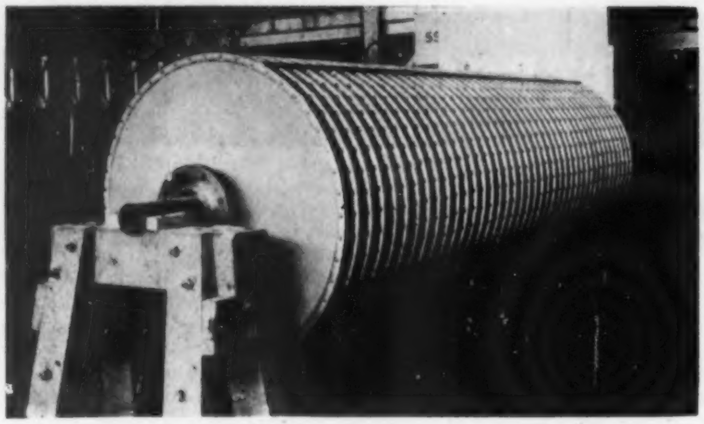


Fig. 3—Vallez filter element, showing rotating metal screens

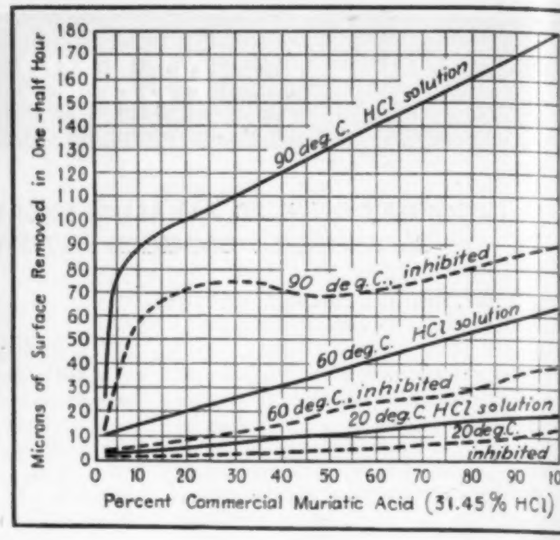


Fig. 4—Corrosion of cast iron by HCl, before and after inhibition by 3 percent (volume) of 80 deg. Brix refinery molasses

effective in protecting Monel metal or brass. Still, the reduction in acid temperature has had an important effect. The 5 percent muriatic acid bath formerly used at 90 deg. C. dissolved Monel metal screens at the rate of 0.3 percent of their weight in the hour required to do the work, while the same strength of acid at 20 deg. C. dissolves but 0.05 percent in the half hour needed to do an equal job.

In order to determine just how effective refinery molasses is as an inhibitor for the corrosion of cast iron by muriatic acid, a series of experiments was carried out, the results of which are summarized in Fig. 4. A cast iron bar was cut into small slabs of equal size which were then immersed, first without and then with 3 percent of molasses, in varying concentrations of muriatic acid at temperatures of 20, 60 and 90 deg. C. In each experiment the loss in weight after one-half hour's immersion was calculated to depth of corrosion of the surface, expressed in microns (100 microns=0.1 mm. or 0.004 in.) The results with uninhibited acid are shown in the solid lines of Fig. 4. After these tests had been made, the same procedure was repeated with acid of the same concentrations and temperatures, except that 3 percent by volume of refinery molasses of 80 deg. Brix and 38 deg. purity was added to the acid solutions. The results of the latter tests appear in the dashed lines of Fig. 4. The irregularity of the inhibited acid at higher temperatures is probably due to breakdown of the molasses. The solid-line curves of Fig. 4 also emphasize the importance of lowest possible acid temperatures.

TREATING EVAPORATORS

A treatment similar to that for filter screens is applied effectively in removing scale from evaporators used for certain refinery solutions and sweet waters. The scale contains silica, but is largely calcium sulphate, a salt which has an inverse solubility curve. Hence it has been possible to replace the former hot solutions with cold which not only gives better removal of the scale, but also reduces acid corrosion. The evaporator bodies are first cooled with water, after which cold water is charged into the first effect to a level slightly above the top tube sheet. To this is added 2 to 3 percent of molasses, plus 2 to 5 percent of commercial muriatic acid, both percents by volume. The mixture is agitated by applying vacuum to the body and admitting air at the bottom, after which it stands for 8 to 12 hours. A light scale responds readily, although for a heavy scale the acid treatment must be followed by a four-hour soaking in hot 2 percent NaOH solution. If the scale is not too heavy in the first effect, the same solution of acid and molasses can be drawn into the second effect where it remains for a similar period of time. The cold acid solution after use is stored in a tank below the evaporators for further service in cleaning the filter screens as described above.

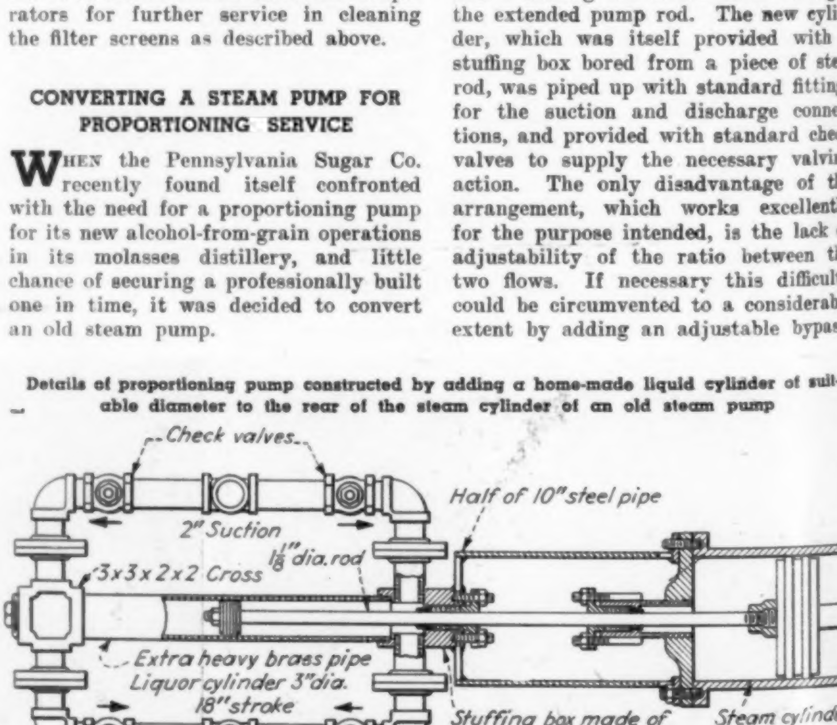
CONVERTING A STEAM PUMP FOR PROPORTIONING SERVICE

When the Pennsylvania Sugar Co. recently found itself confronted with the need for a proportioning pump for its new alcohol-from-grain operations in its molasses distillery, and little chance of securing a professionally built one in time, it was decided to convert an old steam pump.

The steam pump, which was fortunately available, was of the direct-acting simplex type. The problem was solved by adding a new home-made cylinder to the pump to handle the second liquid. Since the liquid end of the pump was 10 in. in diameter and since approximately an 8 to 1 ratio of the two liquids to be pumped was desired, it appeared that a new cylinder made of 3 in. extra heavy brass pipe (2.892 in. i.d.) would do nicely.

The accompanying drawing of the changes made in the pump will make the construction clear. The larger flow is handled by the original liquid cylinder. For the smaller flow the home-made contrivance shown in the drawing was added. A hole was bored through the head of the steam cylinder and a stuffing box added to make tight the extended pump rod. The new cylinder, which was itself provided with a stuffing box bored from a piece of steel rod, was piped up with standard fittings for the suction and discharge connections, and provided with standard check valves to supply the necessary valving action. The only disadvantage of the arrangement, which works excellently for the purpose intended, is the lack of adjustability of the ratio between the two flows. If necessary this difficulty could be circumvented to a considerable extent by adding an adjustable bypass.

Details of proportioning pump constructed by adding a home-made liquid cylinder of suitable diameter to the rear of the steam cylinder of an old steam pump



A CHEM & MET REGIONAL SURVEY

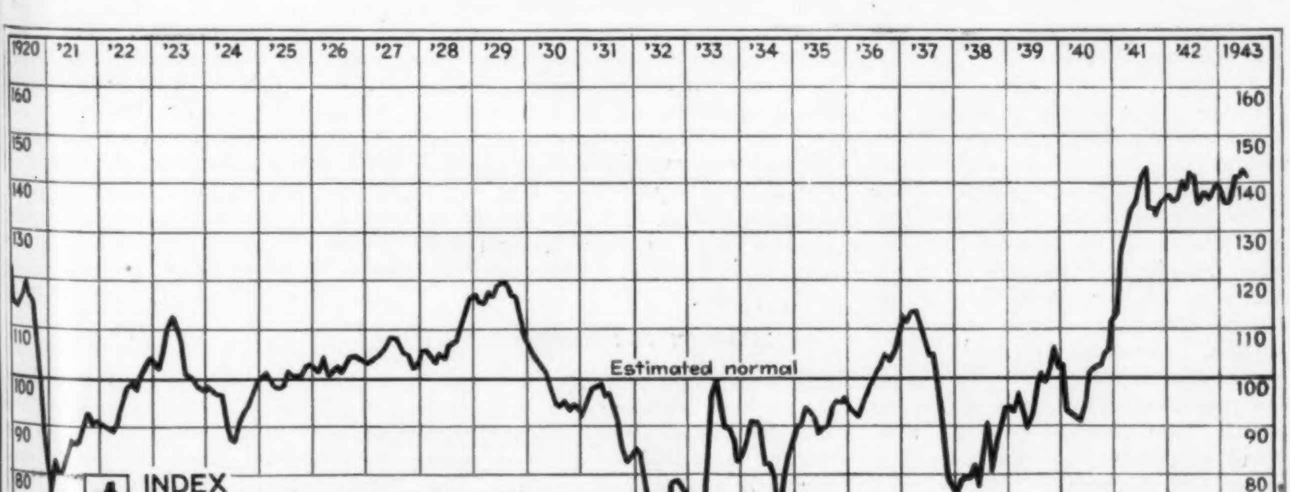
New England in the War And in the Postwar

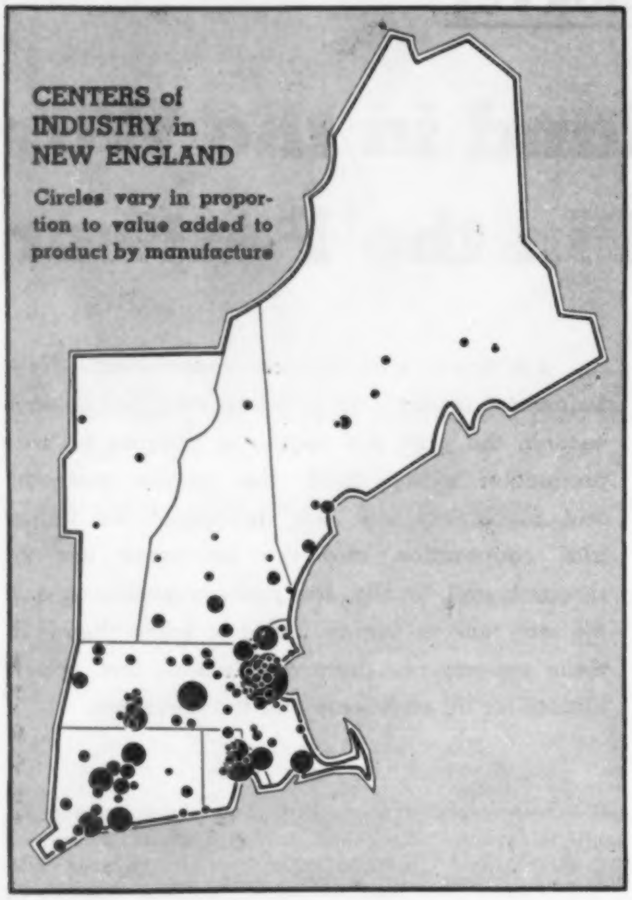
Here is how New England and its people, industries and institutions looked to us in this wartime summer of 1943. Our impressions, together with certain facts and figures that may be of special interest to *Chem. & Met.* readers, are presented in this study, objectively and impartially. We have nothing to sell. We have no cause to promote other than the advance of chemical engineering in its service to the Nation as a whole. With this in mind, we invite you to consider first the traditional and historic contributions New England has made to industry and technology, second, the part this region is playing in war production today, third, the unique methods, and machinery she has developed for industrial cooperation and the increased use of research and, finally, her postwar problems and the way she is setting about to solve them. In these experiences there are lessons and opportunities for all engineers and industrialists.

To quote the words of Calvin Coolidge, "The courage and shrewd foresight of New England folk have formed the heritage of every state in the Union." True as this may be in the Nation's political and social life, it is even truer of her industries. New England is the traditional home of private enterprise—the birthplace during colonial days of many pioneer chemical industries. A couple of centuries later chemical engineering, as we know it today, had its beginnings and early development in this region. Hence we all have some kinship of interest in New England's activities and her problems as well as her progress toward their solution.

Taken in the order of their industrial importance, the six states of Massachusetts, Connecticut, Rhode Island, Maine, New Hampshire and Vermont, represent only about 2 percent of the land area of the United States. Yet they produced 8.6 percent of the Nation's manufactures in 1939 and provided employment in industry for 12.1 percent of the wage earners. Smallest in size of all the states, Rhode Island ranks first in density of population with Massachusetts and Connecticut third and fourth, respectively. More than three quarters of the people in New England are located in urban territory as compared with about 50 percent for the country as a whole. Two-thirds of the total are in nine metropolitan districts. According to the 1930 census of occupations, 43.1 percent of her gainful workers are in the manufacturing and mechanical industries, 7 percent in agriculture, forestry, mining and fishing, leaving a remainder of 49.9 percent engaged in public and professional services, distribution, transportation and communication.

Enrollment in public and private ele-





Civilian Population Trends in New England States

	Rank among United States	Est. Pop. March, 1943	Est. Change Since April 1, 1940
Massachusetts	8	4,156,346	−3.6%
Connecticut	29	1,753,430	+2.7
Maine	36	791,388	−6.2
Rhode Island	37	699,266	−1.4
New Hampshire	45	454,167	−7.6
Vermont	46	322,061	−9.9
Total		8,176,658	−3.2
Estimated Civilian Pop. of U.S. as of March 1, 1943		128,231,363	−2.4
Percentage of Civilian Population in the New England States		6.35	

Source: O.P.A. release based on number of registrations for War Ration Book No. 1.

Some Leading New England Industries and the Relation of their Output to New England and United States Totals

	New England	United States	Percent of N.E. Mfrs.	Percent of U.S. Mfrs.
Woolen and worsted goods	$432,000,000	$698,468,246	8.8	61.9
Dyeing and finishing textiles	117,600,000	332,286,575	2.4	35.4
Rayon manufactures	91,165,000	328,074,327	1.9	27.8
Leather and leather products	273,822,057	1,043,076,164	5.6	26.2
Leather tanned, curried	70,650,000	346,437,554	1.4	20.3
Cotton manufactures	206,600,000	1,168,171,460	4.3	17.7
Paper and pulp	205,875,000	1,159,867,486	4.2	17.7
Rubber products	112,000,000	902,328,802	2.5	12.4
Machinery, except electrical	360,390,216	3,254,173,950	7.4	11.1
Printing, publishing, and allied trades	176,083,000	2,578,464,382	3.6	6.8
Chemicals and allied products	185,562,036	3,733,657,723	3.9	4.97
Stone, clay, and glass	68,950,000	1,440,151,489	1.4	4.7
Food and kindred products	410,349,429	10,618,025,930	8.4	3.86

mentary and secondary schools is 5 percent higher in New England than is the average for the United States. New England's colleges and preparatory schools, and her technical and professional universities are national institutions. It is their product that has helped to spread the New England heritage throughout the country. Conversely, education is a ranking industry in New England with a net trade balance of perhaps $20,000,000 of incoming capital spent on tuitions and student expenses.

New England's greatest resource is, of course, her people and their resourcefulness. The states are notably lacking in most of the natural resources. Her forests, which still cover more than two-thirds of the land area and provide 3.0 percent of the softwood lumber and 2.8 percent of the hardwood lumber production of the United States, are an outstanding exception. Nevertheless, most of the forest area has been cut over within the past two or three generations so that a large proportion of the total stand is suitable only for pulp and paper manufacturing. In fact, 11.2 percent of the country's total pulpwood production is here. This originally led to the establishment of large cellulose industries which must now import a fair proportion of their wood supply from Canada and other sources.

Mineral production in New England is relatively unimportant—contributing in 1939 only 0.59 percent of the Nation's total. Massachusetts ranking 39th among the states leads with $8,179,860, consisting largely of granite and other stone, sand and gravel, lime and clay products. Vermont with marble, granite and slate is next with a mineral production valued at $6,972,234. New Hampshire and Rhode Island ranked 47th and 48th, respectively, among the states in 1939 but the war boom in the mining of mica has suddenly raised the former to a position of strategic importance. In 1942 New Hampshire's mica production was second only to that of North Carolina and in 1943 the output of strategic mica in New England will equal or exceed that of any other domestic region.

INDUSTRY THE MAINSTAY

Manufacturing provides the foundation of New England's economic structure and annually contributes between two and three billion dollars—or more than half of her total income. This income represents the value added by manufacture and includes wages and salaries but not the costs of materials and services. In the aggregate the total value of New England's manufactured products in 1939 was $4,628,718,067, according to the Census Bureau. This was very slightly less than the $5,100,000,000 reported in 1937 when the per capita value added by manufacture amounted to $289 as compared with $195 for the country as a whole. New England's share of all manufacturing income in the United States has fallen from 11.2 percent in 1933, to 10.2 percent in 1935, to 9.9 percent in 1937 and to 8.6 percent in 1939. This, however, is a natural development reflecting the greater relative growth in the West, South and Southwest.

The dominant position of many of the leading industries of New England is well shown in the accompanying tabulation and chart. Wool manufactures head the list with 61.9 percent of the national output and account for 8.8 percent of New England's industries. Dyeing and finishing of textiles comes second, and this is exceedingly important from a chemical standpoint since it represents a market for more than a third of the dyestuffs and textile chemicals consumed in the United States. The total proportion of rayon goods that are manufactured in New England is outstanding despite the fact that the great bulk of the fiber originates outside of the region. Leather tanning,

New England Industries Classified by Major Census Groups

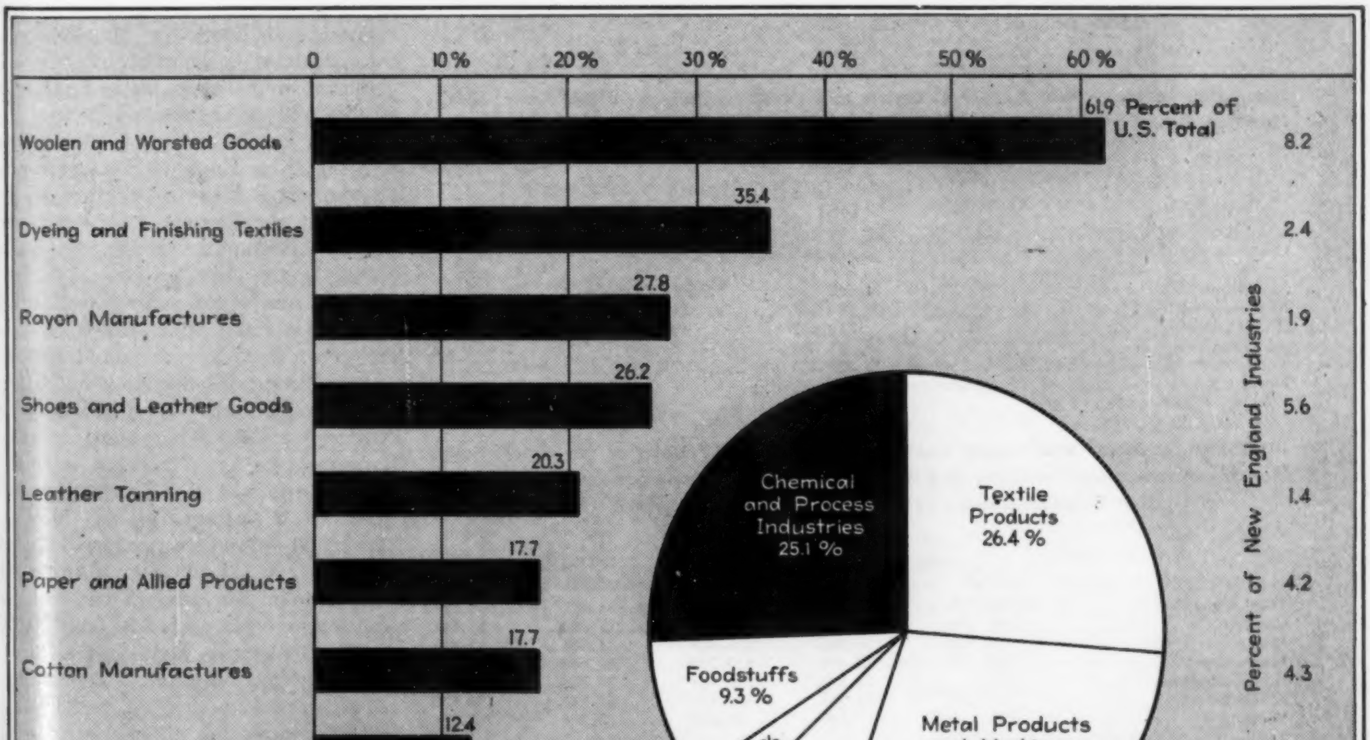
Groups	No. of Establ.	Salaries Personnel	Wage Earners	Salaries of Employees	Wages	Cost of Materials, Supplies, Contract Work, etc.	Value of Product	Value Added by Manufacture
All groups, total	16,136	119,108	945,603	$273,506,005	$985,125,365	$2,344,983,057	$4,628,718,067	$2,336,274,998
1. Food and kindred products	3,495	6,283	46,315	14,265,854	51,896,188	256,950,932	426,697,849	169,746,917
2. Tobacco manufacturers	64	94	1,319	189,353	703,212	1,436,443	3,055,958	1,619,515
3. Textile-mill products and other fiber manufactures	1,257	17,795	260,597	42,956,645	242,208,735	599,677,721	1,009,184,360	462,046,637
4. Apparel and other finished products made from fabrics and similar materials	1,202	4,193	61,056	10,258,424	47,550,719	124,591,627	222,303,158	97,711,531
5. Lumber and timber basic products	712	871	11,039	1,625,978	8,724,912	14,718,233	32,262,527	17,544,294
6. Furniture and finished lumber products	888	2,939	24,445	6,621,900	23,117,109	43,404,693	92,860,748	49,456,055
7. Paper and allied products	534	5,298	45,307	14,424,202	53,426,461	185,457,776	323,279,625	137,821,849
8. Printing, publishing, and allied industries	1,816	11,429	29,141	26,341,286	41,973,184	55,476,901	185,353,795	129,876,894
9. Chemicals and allied products	564	3,782	14,637	9,640,378	18,015,545	91,385,167	185,562,036	94,176,869
10. Products of petroleum and coal	42	377	2,391	892,229	3,835,889	38,041,612	48,640,585	10,598,973
11. Rubber products	104	3,373	23,930	6,870,579	26,258,368	54,004,496	110,317,351	56,312,855
12. Leather and leather products	1,035	8,283	106,657	19,589,768	93,237,560	248,175,296	420,995,960	172,820,654
13. Stone, clay, and glass products	602	2,252	13,485	5,122,534	16,669,163	26,888,606	72,416,706	45,528,100
14. Iron and steel and their products, except machinery	1,014	11,801	76,288	27,944,094	94,082,111	152,664,289	369,920,578	217,256,289
15. Nonferrous metals and their products	704	6,623	49,544	15,875,266	61,367,211	171,231,527	327,131,051	155,899,524
16. Electrical machinery	207	9,081	38,837	20,754,775	49,194,859	95,504,578	251,662,417	156,157,839
17. Machinery (except electrical)	903	14,953	78,392	35,995,440	108,046,901	109,627,990	365,347,589	255,719,599
18. Automobiles and automobile equipment	43	242	2,109	385,187	908,376	1,612,205	4,025,627	2,413,422
19. Transportation equipment except automobiles	110	3,258	16,915	367,426	1,828,838	3,834,821	7,550,605	3,715,784
20. Miscellaneous industries	830	6,181	43,194	13,384,687	42,080,024	70,298,144	170,149,542	99,851,398

Production of Chemicals and Allied Products in New England

State	No. of Establ.	Salaried Personnel	Wage Earners	Salaries of Employees	Wages	Cost of Materials, Supplies, Contract Work, etc.	Value of Product	Value Added by Manufacture
U.S. Total	9,203	63,109	287,136	$165,144,382	$356,184,902	$1,854,140,407	$3,733,657,723	$1,879,517,316
New England Total	564	3,782	14,637	9,640,378	18,015,545	91,385,036	185,562,036	94,176,869
Percent in New England	6.2	6.0	5.2	5.8	5.1	4.9	5.0	5.0
Maine	33	80	275	178,245	227,224	2,591,827	3,785,415	1,193,588
New Hampshire	15	57	220	140,541	274,731	850,640	2,218,369	1,367,729
Vermont	13	32	94	73,142	73,679	564,571	1,110,349	545,778
Massachusetts	364	2,288	7,883	5,967,065	10,286,119	58,468,362	117,650,224	59,181,862
Rhode Island	51	265	637	743,365	735,928	4,554,593	8,103,196	3,548,603
Connecticut	88	1,060	5,528	2,538,020	6,417,864	24,355,174	52,694,483	28,339,309

Compiled from 1939 Census of Manufactures by New England Regional Office, United States Department of Commerce.

Some of New England's leading industries and their relations to United States and New England totals.



pulp and paper, and rubber goods production—all chemical process industries in the sense that they are dependent upon chemical engineering processes and control—rank ahead of the census classification of "Chemicals and Allied Products." This $185,000,000 industry is but 5 percent of the U. S. total and 3.8 percent of New England industry. Yet the broader classification of the "Chemical Process Industries" accounts for more than a fourth of the industries of New England exceeded only by metal manufactures including machinery and by textile products.

The relatively few groups shown by the segments of the accompanying circular chart tend to over-simplify New England's manufacturing structure. As a matter of fact, more than 220 distinct lines of manufacture, or nearly two-thirds of the separate classifications of the entire country, are represented by the highly diversified industries of this region.

"Value added by manufacture" is peculiarly significant in any reference to New England industries. This reveals an outstanding characteristic of many lines of manufacture where precision work of highly skilled labor is used to convert cheap raw materials into relatively expensive finished products. This distinction of being "America's Switzerland" is confirmed by the overall regional statistics of the census. For example, in New England, the "value added by manufacture" is 49.6 percent of the "value of products," while for the Middle Atlantic States it is 45.8 percent, and for the South Atlantic States it is 41.6 per cent. For the country as a whole the percentage is 43.6.

Distribution of New England Research Laboratories by States, 1920-1938

State	1920	1927	1931	1933	1938	Increase 1927–38
Connecticut	11	38	67	61	69	31
Maine	3	4	7	7	9	5
Massachusetts	28	69	118	111	134	65
New Hampshire	2	3	6	5	3	0
Rhode Island	3	9	15	17	22	13
Vermont	0	0	2	2	3	3
Total for New England	47	123	215	203	240	117
Total for U.S.	307	1,147	1,928	1,854	2,237	1,090
Percent in N.E.	15.2	10.7	11.2	10.9	10.8	10.7

Source: Industrial Research and Changing Technology, Nat. Res. Project, WPA, Jan. 1940

Distribution of Technical Manpower in New England

State	Research Personnel: Chemicals and Allied Industries 1927	Research Personnel: Chemicals and Allied Industries 1938	Research Personnel: Total for All Industries 1927	Research Personnel: Total for All Industries 1938	Total College Enrollment 1939–1940	Estimated Number of Chemists and Chem. Engrs. 1943
Connecticut	55	301	362	965	12,860	800
Maine	....	....	45	96	6,092	200
Massachusetts	59	228	618	2,028	57,772	2,000
New Hampshire	....	....	105	74	5,897	100
Rhode Island	31	82	8	50	3,425	300
Vermont	....	13	.....	5	2,975	100
Total for New England	145	624	1,138	3,218	91,021	3,500
Total for United States	3,463	9,542	18,982	44,292	1,493,203	60,000
Percentage in New England	4.2	6.6	6.0	7.3	6.1	5.8

Source: Data on research personnel from "Industrial Research and Changing Technology" National Research Project, W.P.A. January, 1940. Data on enrollment from "Statistics of High Education," & U. S. Office of Education, August 1942. Data on Chemists and Chemical Engineers estimated by *Chem. & Met.*

Distribution of Major War Supply Contracts and Facilities Projects of the Army, Navy, Maritime Commission, Treasury and Foreign Purchasing Missions, Cumulative Through April 1943 for the New England States

(Thousands of Dollars)

State	Total	Supply Contracts	Facilities Contracts
Total Reported	137,291,167	109,866,573	27,424,594
Connecticut	4,979,603	4,744,702	234,901
Maine	816,412	734,387	82,025
Massachusetts	4,343,355	3,872,712	470,643
New Hampshire	190,353	144,063	46,290
Rhode Island	712,562	494,161	218,401
Vermont	88,881	81,383	7,498
Total contracts issued to New England States	11,131,166	10,071,408	1,059,758
Percentage of total number U.S. Contracts issued to New England States	8.2	9.2	3.8

Distribution of Major War Supply Contracts and Facilities Projects of the Army, Navy, Maritime Commission, Treasury, and Foreign Purchasing Missions, Cumulative of the New England States, by Major Object Through April 1943

(Thousands of Dollars)

State	Supply Contracts: Aircraft	Supply Contracts: Ships	Supply Contracts: All Others	Facilities: Industrial	Facilities: Non-Industrial
Total Reported	33,904,338	18,346,495	57,615,740	15,394,297	12,030,297
Connecticut	2,502,074	290,261	1,952,367	211,160	23,741
Maine	10,000	495,949	228,438	34,334	47,691
Massachusetts	248,535	1,513,968	2,110,209	301,653	168,990
New Hampshire	....	1,098	142,965	30,376	15,914
Rhode Island	549	41,198	452,414	67,743	150,658
Vermont	....	687	80,696	3,966	3,532
Totals for New England States	2,761,158	2,343,161	4,967,089	649,232	410,526
Percentage of total U.S. contracts issued to New England States	8.2	12.3	8.7	4.2	3.4

Source: War Production Board, Regional Office, No. 1, Boston, Mass.

CHEMICALS & ALLIED PRODUCTS

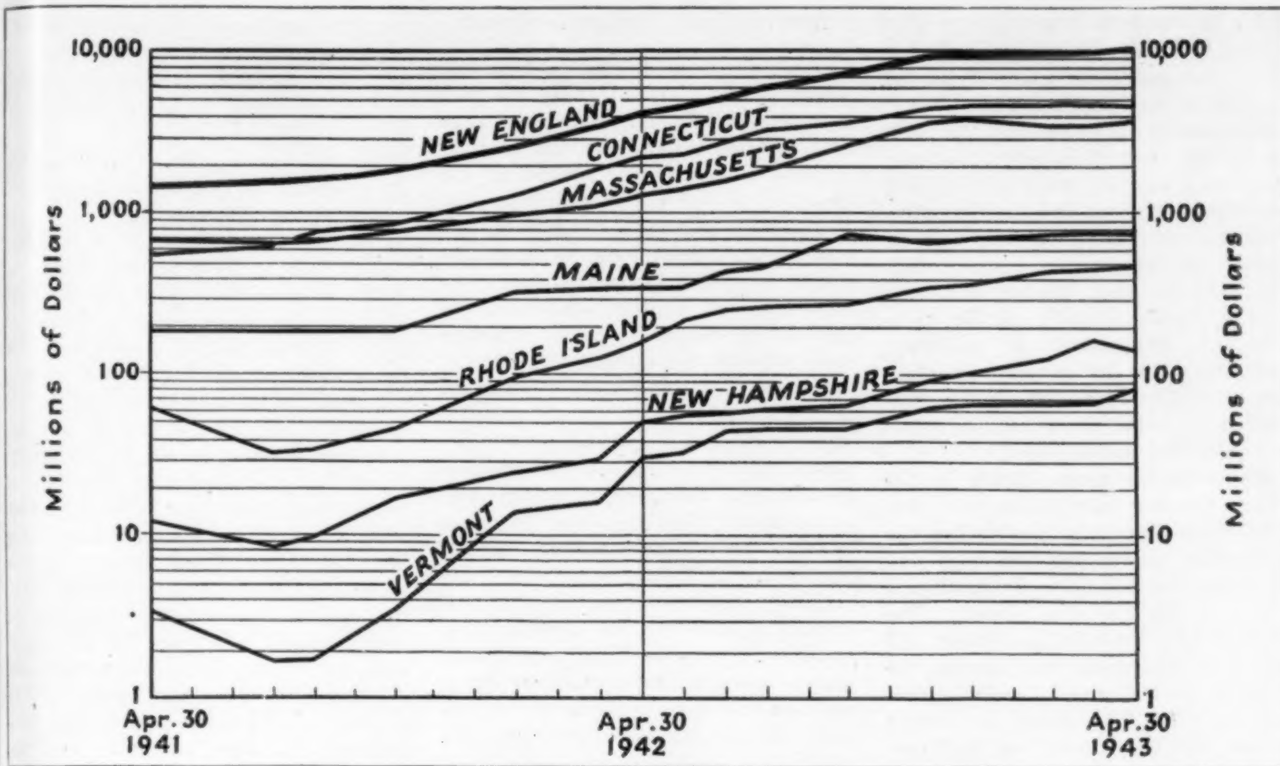
Group 9 of the Census is itself a highly diversified classification of industries, including in addition to chemicals n.e.c. (not elsewhere classified) such important chemical process industries as paint and varnish, fertilizers, insecticides, soap and glycerine, perfumery and cosmetics. As will be noted in the tabulation on page 121, Massachusetts is by far the most important New England state in Group 9. Its output is more than twice that of Connecticut which in turn is at least six times that of Rhode Island, fourteen times that of Maine.

Figures for such individual industries in the different states as may be shown by the Census are given on p. 124. In nearly all instances, however, the "All other industries" category is exceedingly large in order not to reveal the operations of individual companies. Thus for Massachusetts the output of her important soap and glycerine industry is lumped into the $53,590,582 of unclassified items.

From the foregoing it is obvious also that New England must of necessity import a large proportion of the chemical requirements for her important consuming industries. As shown by the chart on page 125, contrasting production with consumption of chemicals and allied products, it is estimated that New England has an annual chemical deficit of about $100,000,000 which must be supplied by industries outside of her borders. Following is the basis for that estimate.

The Bureau of the Census reported total U. S. production in 1939 of "Chemicals and allied products" valued at about $3,735,000,000. Adjusting that to take into account our balance of foreign trade leaves $3,650,000,000 worth of chemicals and allied products for home consumption. This represented about 12 percent of the $30,255,000,000 spent by all manufacturing industries for their purchases of materials and supplies.

While there is wide variance in the use of chemicals and allied products



Major war supply contracts for New England and New England States, cumulative from June, 1940

in the different lines of manufacturing, it seems safe to assume that the industries of New England are so numerous and so well diversified that there would be but little room for error in applying the national average and asserting that 12 percent of the materials and supplies purchased by New England manufacturers in 1939 was represented by chemicals and allied products. Applying this percentage to the official data on materials for the various states gives estimated consumption figures as follows: Maine, $21,700,000; New Hampshire, $15,000,000; Vermont, $5,700,000; Massachusetts, $143,700,000; Rhode Island $40,000,000; and Connecticut $60,000,000—or a total of $286,100,000 as contrasted with total production of $185,600,000.

To argue that all of this annual deficit of $100,000,000 worth of chemicals and allied products should be made in New England overlooks many economic factors that may have made plant location more advantageous in other parts of the country. Raw materials, fuel and transportation may have outweighed market consideration for some commodities. But it is undoubtedly true that there are other important chemicals and allied products which might logically be made in closer proximity to such large chemical consuming industries as textile dyeing and finishing, leather tanning and pulp and paper manufacture. The fact that competitive plants located outside of New England are able to obtain their chemical raw materials on a more economical basis may have been one factor in the loss of some of these consuming industries to other parts of the country. Fortunately, this situation is now being corrected by more accurate market research and technical services on the part of the more progressive chemical manufacturers in the area.

WARTIME NEW ENGLAND

To even the casual observer it is apparent that the war has changed the pattern of New England industry. Except around shipyards and aircraft plants one sees few, if any, of the boom towns that have sprung up around the huge new munitions centers of the Middle West and South. But everywhere there is greatly increased activity. This is most marked, of course, in the expansion of New England's largest industry, metal working. But plants making consumer goods like shoes, clothing and textiles have quickly and almost completely converted over to war production.

The over-all war picture of New England was presented by the War Production Board in striking fashion in the report for its Region No. I ("The Arsenal of America," WPB 3248, April 26, 1943). This showed that the six New England states were building more than 15 percent of the nation's ships, 25 percent of the machinery and electrical equipment and producing 23 percent of the clothing and textiles of the armed forces. In round figures, the New England States are working on $10 billion of war contracts or 10.1 percent of the national total.

In many respects New England was better prepared for the war than almost any other section of the country. Quoting the WPB release: "When the crisis came, thousands of firms in the area pitched in on war contracts and needing only 4.5 percent of the country's plant and facility awards, in addition to their existing facilities, were able to handle more than 12.1 percent of the national war contracts whereas in 1939 they did only 9.8 percent of the total manufacturing business. In contrast, one other WPB region needed 18 percent of new facilities to handle 11.3 percent of the war contracts; while a third had to get 15 percent of new plant facilities to handle 9.9 percent of the orders."

Most of the federal money spent on new facilities in New England went into the restoration and expansion of shipyards ($220.5 million), into new aircraft plants ($109.7 million) and into gun and ammunition factories ($141.9 million).

Maine, ranking 36th in population, stood 41st on the list of states in government facility awards, yet it ranks 13th in volume of war produc-

tion with contracts totalling over $700 million. Today Maine is producing $3 in war goods for every dollar of pre-war civilian production.

Connecticut has become the center for the aircraft industry, not only for planes, engines and propellers but for rifles, armament and machine guns. Vermont and New Hampshire war industries produce textiles, leather products, asbestos, mica, lumber and wood pulp. Rhode Island's textile mills went into the making of uniforms, tents, etc. Her 300 jewelry manufacturers quickly converted to the production of bullet dies, torpedo parts and precision instruments.

Massachusetts ranks eighth in the nation for her war contracts. But little conversion was needed for the big textile plants and the boot and shoe factories that normally produce a third of the nation's needs. The tougher jobs came in machinery and electrical equipment but again the existing plants were already tooled and with but 2.9 percent investment in new facilities, turned out 25.9 percent of the country's requirements.

Value of Production for Chemical and Allied Industries in New England States as Shown in 1939 Census

Connecticut	
Cleaning and polishing preparations	$1,725,828
Fertilizers	1,703,608
Insecticides, etc.	1,545,250
Paints and varnish, etc.	2,934,820
Perfumes, cosmetics	5,598,993
Other industries (chemical and allied products) unclassified	39,185,984
	$52,694,483
Massachusetts	
Chemicals, n.e.c.	$7,470,222
Cleaning and polishing	5,590,327
Compr. and liquefied gases	1,547,000
Drugs and medicines	13,942,218
Fertilizers	2,566,222
Glue and gelatin	8,514,433
Grease and tallow	4,645,195
Insecticides, etc.	1,517,257
Paints, varnishes, etc.	11,704,739
Perfumes, cosmetics	606,550
Printing ink	1,994,987
Tanning materials	3,960,222
Other industries (unclassified)	53,590,852
	$117,650,224
Maine	
Fertilizers	$2,491,879
Insecticides, etc.	132,095
Other industries (unclassified)	1,161,441
	$3,785,415
New Hampshire	
Chemicals and allied products (unclassified)	$2,218,369
Rhode Island	
Chemicals, n.e.c.	$1,164,736
Tanning materials	2,126,377
Other chemicals and allied industries (unclassified)	4,812,083
	$8,103,196
Vermont	
Chemicals and allied industries (unclassified)	$1,110,349

APPLYING THE RESEARCH METHOD

Much of New England's economic progress and vitality during the past two decades can be traced to the work of an organization that has literally applied the research method to the problems of regional development. Established in 1925 as a research agency and advocate of the coordinated economic interests of the six states, the New England Council has become an institution unique both in structure and mission. Although consistently sponsored by the six New England governors, it is not a governmental agency for its membership is comprised solely of business interests—individuals, firms, corporations and associations. Its one objective is to advance the economic welfare of New England. It faces its problems objectively and realistically. Its approach is to define the problems, assemble all pertinent facts, analyze and digest them, formulate policies for a solution and then organize and stimulate action in support of these policies. In short, it applies the research method to New England's economic and regional problems.

The Council has long been interested in promoting scientific and industrial research by New England industries. Its very first action after having been set up as the permanent organization of the first New England Conference held in Worcester, Mass., Nov. 12, 1925, was to appoint a Research Committee. Under the leadership of Chairman Lincoln Filene "it not only brought about a number of studies of direct value to important New England industries, but also, through its brilliant achievements in the field of research, impregnated the whole organization with the firm belief in the research method which has characterized it ever since."*

Other important "working" committees of the Council became concerned with recreational development, agriculture, community development, aviation, statistical research, and publicity and advertising.

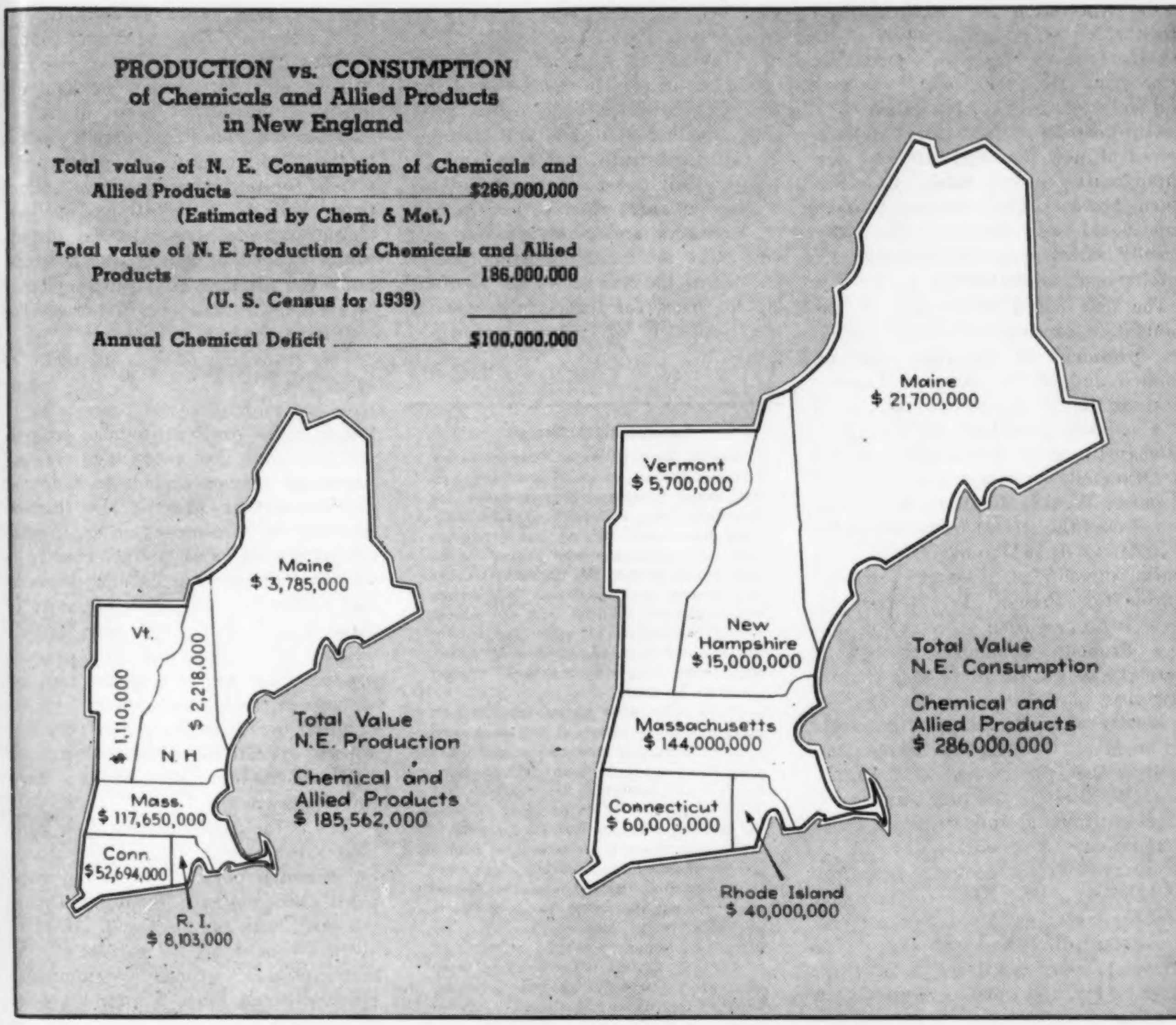
Back in 1938 when C. F. Weed, the banker, was president of the New England Council, he approached President Karl T. Compton of the Massachusetts Institute of Technology and asked him to assist in forming a New Products Committee, whose objective would be to stimulate the development and production of new products in New England. The two agreed that to whatever extent such a committee succeeded in its work, it would "add payrolls and profits to the region and would protect existing industries in this region, which without new products or processes would inevitably tend to pass into the discard."

As set up by Dr. Compton, the New Products Committee functioned through four subcommittees. The first of these concerned itself with "Research Day in New England"—an institution sponsored annually by the Council, the Engineering Societies of New England, and other groups. Prior to the war, it was the annual custom for technical groups in each of the six states to organize one full day of meetings (usually in May) which were often held simultaneously in ten or twelve important New England cities. Able speakers and group leaders were assigned to point out to the business community the vital importance of industrial research in the development of new products, new uses for old products, and better production methods. As remarked by Dr. Compton, "The attempt was primarily to make New England industry research- and development-minded. The efforts have been directed particularly toward the smaller industries that employ 50 men or less, which may find themselves in a situation of technological obsolescence unless we have some activity in this field."

The second operating committee devoted itself to mineral resources—and as might be expected, found rather sparse data with which to work. It recommended a complete economic survey of New England's resources and had this been completed by 1941, it would have greatly aided the development of domestic supplies of several critical and strategic materials now being produced in the area.

The third committee on New Industrial Products started out to be a sorting and screening agency to select new things to manufacture and to help in bringing them into successful production. This approach proved difficult and wasteful so the committee took another tack. By studying the materials now being imported into New England for her industries, they hoped to find out what new products (chemicals, for example) might profitably be made within the region. This study seemed to have definite possibilities. Purchasing agent associations cooperated in revealing many raw materials, intermediates and semi-manufactured goods that could be made more advantageously in New England. Some of these studies have already proved productive—as, for example, the manufacture of glass textiles and other fiber glass products. Staple rayon is an important raw material for New Eng-

* This tribute was paid to Mr. Filene's work by Dudley Harmon, who since 1926 has served as executive vice president of the New England Council.



land manufacturers and, had the war not interfered, a $100,000,000 plant investment was definitely scheduled.

The fourth committee was on Venture Capital. After the others had found the new products to be manufactured, this committee was to find out how to finance them. Everyone knows, of course, that there is plenty of money in New England. Capital, along with brains, has long been one of her principal exports. She has financed ventures all over the world but, for the most part, has confined her New England investments to the ownership of preferred securities in conservative and long established industries. The problem, according to the committee, was to encourage an appreciation for the greater return from real risks rather than from "sure bets." Dr. Compton cited a number of examples of New England industries that had grown directly out of research. He quoted W. M. Rand of Monsanto to the effect that fully 50 percent of their present products were unknown 20 years ago. The Chain Belt Co., which has a plant in New England, reported that one-third of their products had been developed within the past ten years and that two-thirds of their sales were represented by new products or old products that had been improved or redesigned.

What was perhaps the most important conclusion to come from Dr. Compton's committee was that New England needed a "program of industrial or engineering research which can find out what are the actual determining factors involved in the question of the location of a plant in New England versus the Middle West or some other place, and to present the material to a company which is considering establishment of a new plant." The committee concluded that "some permanent organization should be developed to study industrial opportunities which offer the chance of major development and to assemble factual information on which decisions in regard to location of industries in New England can be intelligently based."

RESEARCH FOUNDATION ESTABLISHED

At the quarterly meeting of the New England Council at Swampscott on June 20, 1941, Dr. Compton's committee made its formal recommendation "that a permanent organization be established under the name of the New England Industrial Research Foundation, Inc., and provided with sufficient funds to enable it to support a small operating staff and to engage the technical services of consultants as required." The recommendation was accepted and the foundation was set up with Earl P. Stevenson of Arthur D. Little, Inc. as its first president. Seventeen Founders were carefully selected in order to provide both geographical and professional representation throughout the New England states. A smaller body of seven Trustees were selected to have direct supervision of the active management of the foundation and to employ the working staff. The foundation was set up as a non-profit organization with initial operating funds subscribed

in the expectation that its earnings or other receipts would maintain it as a going concern. Receipts or earnings arise from fees charged for surveys and from retainers for consulting services in keeping various companies apprized of new developments and new opportunities in their fields. Care was taken, however, that the new foundation should not compete in this latter activity with commercial research and development laboratories.

The first board of trustees of the foundation consisted of Ralph Flanders, president of the New England Council and of the Jones & Lamson Machine Co. of Springfield, Vt.; Karl T. Compton, president of Massachusetts Institute of Technology; Albert E. Marshall, president of Rumford Chemical Works, Rumford, R. I., who was elected the second president of the Foundation in 1943; and Harold Ladd Smith, director of research, Vermont Marble Co., Proctor, Vt. Richard B. Cross, who had been secretary of the New Products Committee, served as secretary of the foundation during its first year.

Shortly after the first annual meeting on March 2, 1942, the Trustees announced the appointment of Dr. Lawrence W. Bass as the first director of the New England Industrial Research Foundation. A graduate of Yale in chemistry with his doctor's degree in biochemistry, Dr. Bass returned to New England from his important post as assistant director of the Mellon Institute of Industrial Research in Pittsburgh. He had spent a number of years in graduate study and research abroad and had served on the scientific staff of the Rockefeller Institute for Medical Research. From 1932 to 1936 he was director of research for the Borden Co., with plants in New England and elsewhere in the United States. From such a background of experience the new director brought the viewpoint and knowledge of methods and practices of modern research and development.

His first public appearance in New England was at the 1942 Research Day observance in Boston on May 15 where he made a splendid appeal for greater emphasis on technical excellence. "New England's goal should be quality," he said, "quality of product, of operation, of management. History records many cases of peoples who have risen far beyond the levels of their natural resources through the sheer power of intelligence in their manufacturing operations."

At the 18th N.E.C. annual conference, Nov. 19, 1942, Dr. Bass declared: "New England manufacturers today need technical help more than ever before to aid them in the problems of our wartime economy. Technical advice is essential in reaching sound decisions, in adapting manufacturing facilities, making new products, converting to new operations or in using substitute materials and for proper fulfillment of specifications. Those companies which obtain the help of engineers and scientists not only will make the most important contributions to the war effort but also will lay the basis for successfully meeting the challenge of postwar readjustments."

Parenthetical Thought

One of New England's important exports is *brains*—some of the very best the nation produces. For decades the so-called "ivy colleges" of New England have been turning out graduates and post graduates who scatter to the four winds to man the nation's top jobs in research and teaching. This stands out in marked contrast with the educational institutions of other sections of the country that are concerned principally with supplying the home market for their product.

There is likewise an important export of brains in the shape of technical services by consulting laboratories and other organizations of national significance. One old and important firm confides that fully 85 percent of its business is done for industries outside of New England.

Likewise there is an export of brains in the chemical engineering equipment that goes from New England to industries all over the world. Some of this is precision work, instruments, etc., for which the region is peculiarly qualified to produce. On the other hand, a great deal of the world's equipment in the field of petroleum distillation, for example, is designed on desks in New England and fabricated elsewhere. One company that has had a large share of war contracts in the chemical engineering field reports that less than 2 percent was in New England.

Some phases of the important program that the founders laid out for the New England Industrial Research Foundation have had to be deferred because of the heavy demands of the war effort. It has, however, already demonstrated that it can serve a unique and most important function in providing advice and leadership, particularly to the many smaller companies that in the past have suffered because of a lack of technical guidance. The emphasis which Dr. Bass has repeatedly placed on the greater employment within New England industries of engineers and scientists is the most promising portent of postwar strength and progress.

POSTWAR PROBLEMS AND PROMISES

New England faces less serious problems in reconversion than is the case for most other sections of the United States. The major war contributions of her textile, leather and machinery plants were made without extensive alterations in their operations and hence can be immediately shifted to the job of meeting the pent-up demands for peacetime products. Thus there will be a breathing spell—a temporary advantage if this opportunity is used to develop the new and improved products that will inevitably be demanded once the first rush for consumer goods is over.

This transition period will make or break New England. If her industries are content to use prewar facilities to make prewar products by prewar processes, her postwar boom will prove but a brief prelude to a deeper depression than that of the thirties. She will be in competition with modern plants that will be converted from war production to make new products and materials. The costs of many of these plants will have been largely written off. Some of the postwar products that will be made in them are already in the laboratories and on the drafting boards of the companies that hope to operate these plants to provide employment and capitalize on their war experience.

This is the challenge that New England must meet. It will call for a number of important changes in viewpoint and practice. What Dr. Compton has said so well and so often about the need for the revival of venture capital is a primary consideration. Her industries must not only become more research-minded but must do something about it. Dr. Bass has emphasized one of the first requisites—the employment within New England industries of more research chemists and physicists, more engineers and technicians. If instead of exporting talent to teach and manage technical enterprises elsewhere in the country, these same men could find equal opportunity in New England, many of her postwar problems would be a long way toward their solution. New England can regain and maintain industrial leadership in this country through creative research, guided by alert, intelligent technical management and backed by patient but venturesome capital. New England's heritage of Yankee ingenuity will stand her in good stead if she puts it to work *at home.*

Reprints of this 8-page report are available at 25 cents per copy. Address the Editorial Department, *Chem. & Met.*, 330 W. 42nd St., New York, N. Y.

PROCESS EQUIPMENT NEWS

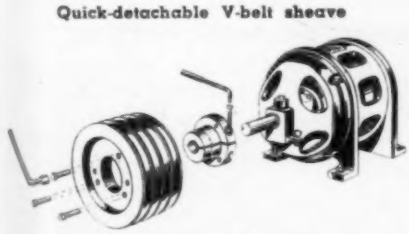
QUICK DETACHABLE SHEAVE

USERS of multiple V-belt drives will be interested in the new QD (quick detachable) sheave which has been announced by Pyott Foundry & Machine Co., 328 North Sangamon St., Chicago, Ill. Outstanding features of the new sheave are the ease and speed with which it may be attached to or removed from a shaft. A socket wrench is the only tool required. The principle of the new sheave is indicated in the accompanying illustration. First, a tapered split hub of special design is slipped on the shaft in line with the keyway. Then a headless cap screw is tightened down with an inserted key, clamping the hub firmly on the shaft and producing what is virtually a press fit. The next step is attachment of the sheave to the tapered hub by means of three pull-up bolts which are tightened with a socket wrench. In removing the sheave from the hub two of the pull-up bolts are inserted in the additional holes shown, and tightened down against the face of the hub, acting as jackscrews to force the sheave from the hub. Different diameters of sheaves may be used with the same hub and a complete selection of sheaves and hubs is available.

DROP-BOTTOM BOX

AN ALL-STEEL BOX for use with high-lift power trucks and designed for dumping through power supplied by the truck has been developed by the Union Metal Mfg. Co., Canton, Ohio. The new drop-bottom dump skid box, shown in the accompanying illustration, is attached to a skid platform with a continuous hinge at one end. Attached to the top rear of the box are latch rings which are hooked over plates welded to the truck mast. In operation the skid portion is entered with the forks or platform of a truck, the box elevated and the latch rings attached. As the forks are lowered the skid portion goes down while the box portion goes up and the contents of the box is then dumped in front of the unit. Side plates on the skid serve as a chute to keep the contents from spilling out of the sides during the dumping cycle.

Quick-detachable V-belt sheave



Drop-bottom dump skid box

MAGNETIC LEVEL INDICATOR

FOR REMOTE INDICATION of water level in a boiler drum or other elevated vessel, Yarnall-Waring Co., Chestnut Hill, Philadelphia, Pa., has developed a new differential-pressure instrument in which the differential is the difference in head between a fixed water level in a pressure pot connected to the upper part of the boiler drum, and the varying water level in the drum itself. This differential pressure is applied through tubing to the two sides of a neoprene diaphragm. Since the diaphragm is spring-loaded, it attains a definite position for every differential. Movements of the diaphragm carry a powerful permanent magnet along a bronze alloy tube containing a spiral armature of magnetic material. Thus rotation of the armature, and correspondingly magnified motion of the pointer connected to it, is obtained by changes in the static head in direct proportion to level variations. Use of the magnetic transmission permits complete separation of pressure parts from non-pressure parts without stuffing boxes. Thus, the magnet and the spring-balanced diaphragm are in a pressure chamber, while the jewel-bearing armature within the bronze tube operates freely without packing and at atmospheric pressure. The combination of magnet and spiral armature is said to be equivalent to a worm wheel driving a steep-pitch worm, except that normal tooth friction between the wheel and worm is eliminated.

Remote water level indicator

IMPROVED FIN TUBE

TO EFFECT an improvement in heat transfer efficiency under certain circumstances, the Brown Fintube Co., 160 Filbert St., Elyria, Ohio, has added a "cut-and-twisted" type of Fintube to its line of integrally bonded finned-tube heat exchange elements. The new development consists in taking a standard type of longitudinally finned tube, cutting the fins transversely at desired intervals, and twisting the ends as shown in the accompanying illustration. This cut and twist produces greater turbulence of the fluid outside the tubes than the conventional construction and is said to increase heat transfer efficiency by as much as 50 percent in types of heat exchangers in which the shell-side fluid is held closely against the tubes.

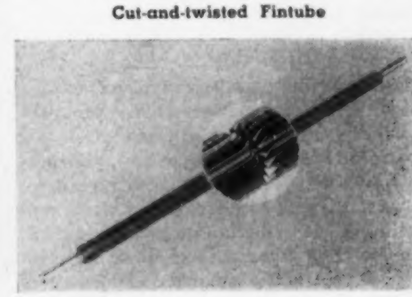
RESISTANT FLOOR

BECAUSE of its resistance to acid, water, oil and grease, the name of Awog has been given to a new industrial floor product recently announced by the Flexrock Co., 2312 Manning St., Philadelphia, Pa. In addition to being impervious to the materials mentioned, the floor is said to offer exceptional durability, smoothness and dustlessness. It is claimed to withstand extremely heavy traffic. The material can be applied to new floors as an overlay on concrete, brick, wood or stone; and used on existing floors for the purpose of repairing and resurfacing areas of any size desired.

CONVEYOR BELT CONSTRUCTION

TO PROVIDE greater resistance to cutting action from materials striking the belt, as well as greater adhesion between the cover and carcass in rubber-covered conveyor belting, the B. F. Goodrich Co. has developed and recently received a patent on the Transcord Breaker in which the breaker cords are placed across the belt width rather than parallel with

Cut-and-twisted Fintube

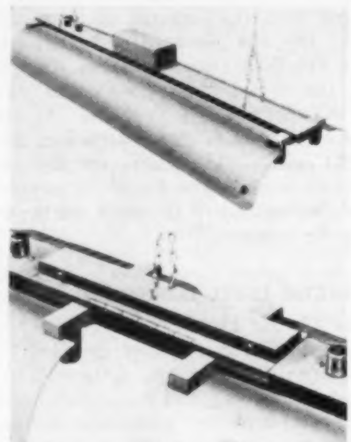


the cords of the belt itself. This construction is said to provide greater resistance to various deleterious influences, a fact which is claimed to have been proven definitely by parallel tests of conveyors made by the new and old constructions. The new construction is also said to tend to stop cuts and gouges before they penetrate to the belt carcass. Furthermore, it prevents distortion of the rubber cover beyond its elastic limits because of severe impact. This is important since rubber is susceptible to cutting or gouging under extreme tension. In use, the Transcord Breaker is usually placed a short distance above the top ply, leaving a protective layer of rubber between the breaker and the carcass.

"Squeez-Grip" extinguisher valve in use

FIRE EXTINGUISHER VALVE

As an aid in the operation of portable carbon dioxide fire extinguishers, the C-O-Two Fire Equipment Co., Newark, N. J., has developed a new type of valve known as the "Squeez-Grip." The new valve operates by a lever directly over the carrying handle of the extinguisher. By merely applying pressure, or squeezing, with one hand, the valve is opened and the gas discharged. On releasing the pressure, the valve closes and the discharge is cut off. Thus, the valve can be opened and closed without setting down the extinguisher, which must be done when a handwheel type of valve is used. Hence, time is saved in maneuvering around a fire. Furthermore, the valve is stated to close tightly against its seat under the tremendous gas pressure in its own cylinder, thus requiring no replacement parts and no disassembly for re-filling.



New fluorescent lighting fixture showing "Flexi-Coupler"

FLUORESCENT LIGHTING FIXTURES

Equipment designated as its new "5,000-Line" of industrial fluorescent lighting fixtures has just been announced by Martin-Gibson Co., 999 Harper Ave., Detroit, Mich. An important feature of these new fixtures is the "Flexi-Coupler", a device which permits spacing of fixture units as much as 6 in. apart, yet preserves the other features of a continuous-run installation. This makes possible the use of only nine 100-watt fixtures in a 50-ft. run, instead of ten, with a consequent saving in current and cost. The fixtures are built in conformance with government conservation requirements, the non-metallic reflectors attaining an unusually high reflectance factor of 89-91 percent, according to the manufacturer, due to the company's special method of enameling. The fixtures are available in two 40-watt, three 40-watt and two 100-watt sizes.

New Micro pressure switch

PRESSURE SWITCH

For proportioning control of motor-operated valves, power units, program switches, etc., for the regulation of steam, air and gas pressures, Barber-Colman Co., Rockford, Ill., has introduced a new Micro pressure switch consisting of a single-pole, double-throw, three-wire instrument with a positioning solenoid. The sensitive element consists of a bellows mechanism which positions the switch. When a change in pressure causes the switch to make contact in one direction, a separate electrically operated power unit is caused to rotate in the direction tending to correct the pressure change. At the same time a potentiometer contact is moved, changing the current through a positioning solenoid which tends to return the switch to its original position, breaking the contact and thus producing a definite position of the power unit for every pressure. The motor of the power unit is directly connected to the control valve or other final control element.

Air heater for process use

PROCESSING HEATER

Developed especially for drying and dehydration operations in chemical processes, a new direct-fired heater has been developed by Dravo Corp., 300 Penn Ave., Pittsburgh, Pa., with which it is said to be possible to produce output temperatures between 150 and 350 deg. F., with the heated air free from contamination from the coal, gas or oil fuel used, and without use of critical alloy steels. The new heater employs carbon steel combustion chambers and a recirculating device which allows heated air to be fed back to the heater's intake. The output temperature depends on the percentage of air recirculated, 80 percent recirculation being required to produce a temperature of 350 deg. F. According to the manufacturer, the new heater has numerous advantages, including saving of fuel as a result of high efficiency of heat abstraction and negligible radiation loss; quickness of installation; availability for quick shipment; flexibility of the installation as regards later plant extensions; and ability to be operated by unskilled labor. Heaters designed for operation on coal can later be converted to oil or gas, if desired.

REMOTE RECORDER-CONTROLLER

Among several new rotameter type flow metering instruments announced by Fischer & Porter Co., Hatboro, Pa., is the new Magna-Bond remote recorder and controller, the particular feature of which is a magnetic transmission between the rotameter and the telemetering equipment, thus eliminating the need for a packing gland and its attendant friction. As is shown in the accompanying illustration, the rotameter is totally inclosed and the movements of the metering element are followed on the outside by means of a magnetic follower.

An armature attached to the other end of the magnetic arm moves in an inductance coil and forms part of an inductance bridge circuit, with a similar coil and armature in the recorder-controller case. The armature of the latter instrument positions a pen arm to coincide with the rotameter float position, and also operates a pneumatic control system to maintain the flow automatically as indicated by the set pointer in the controller case. The instrument is recommended by the manufacturer for

use in high-pressure and high-temperation operations where the direct use of inductance coils on the rotameter would be affected by high temperature or temperature changes. It is also suggested for opaque substances where the float could not be seen, and for substances corrosive to glass, such as hydrofluoric acid or hot caustic soda which require an all-metal rotameter. If desired, the instrument may be obtained with a pneumatic rather than an electrical transmission means. The latter type of transmission is particularly suited to use with flammable liquids and gases.

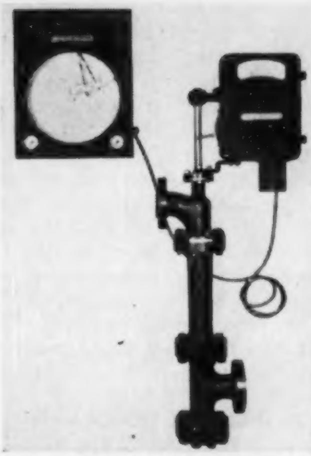
The company has announced several other new rotameter developments, including a vacuum-jacketed rotameter for measuring flows at low temperatures without frosting, or for the handling of fluids which must be kept hot because they solidify at room temperature. Another new rotameter for liquids corrosive to the normally used metal fittings is available with Haveg or glazed ceramic fittings. This type is equipped with the new Fischer-Dow packing gland which presses in two directions upon a wedge-shaped packing which effectively seals the metering tube and prevents leaks. Still another new type is an armored rotameter for high temperatures and pressures, in which the metering tube is of metal. A pointer attached to the float is observed through a high-pressure sight glass of the flat gage-glass type. This design can be built for temperatures to 600 deg. F., and pressures as high as 10,000 lb. per sq.in.

IMPROVED LIFT TRUCK

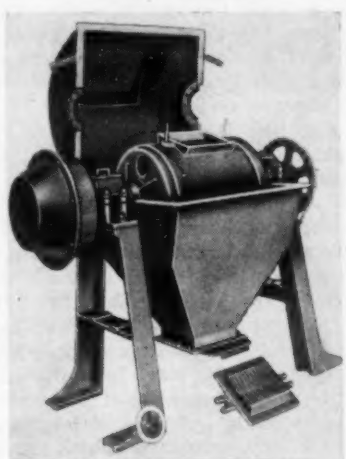
SEVERAL new features have been added to the improved lift-type Turret Truck manufactured by the Salsbury Corp. of Los Angeles and distributed by the Nutting Truck & Caster Co., Faribault, Minn. One improvement is an easy-to-reach hand-operated hydraulic lever for lifting the platform, which is situated at the right of the driver's platform. At the left of the driver's platform is the load-wheel brake pedal which actuates internal expanding brakes on the two load wheels. The accompanying illustration clearly shows these improvements. The operator's platform is now wider than on previous models. Another important improvement is the fully inclosed primary drive chain which is said to have longer life and require less frequent lubrication. The lift platform has now been tapered to permit oblique angle entrances to skids.

COMBINATION GRINDING MILL

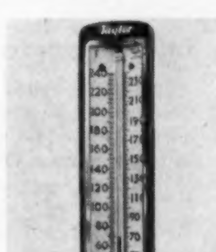
To PERMIT multiple processing operations in laboratories and in special plant operations, Abbé Engineering Co., 50 Church St., New York, N. Y., has introduced a new combination grinding mill consisting of a steel cylinder rotating in bearings and provided with hollow trunnions at either end. At the feed end is a drum type spiral feeder attached to one trunnion, and at the other, a discharge grating to prevent discharge of the grinding media. Both trunnion



Magna-Bond flow meter



Combination grinding mill



New industrial thermometer

Improved Salsbury lift truck

openings can quickly be closed for batch grinding. The shell is provided with a manhole opening closed with either a solid or slotted cover.

When the mill is used for batch operation, it may be run as a pebble, ball or rod mill, either wet or dry. For special operations it may be jacketed for heating or cooling, held under pressure or vacuum, or supplied with or purged of a gas or liquid during operation. For continuous grinding it may be operated in the various modes mentioned above, its drum feeder may be used for wet or dry materials, gases or liquids may be added or withdrawn during operation, and it may be heated or cooled. To produce a granular product with few fines, it may discharge through the slotted cover into a dust tight discharge housing which can be supplied.

INDUSTRIAL THERMOMETER

ONE-PIECE case construction is employed in a metal-saving industrial thermometer design recently announced after field tests by Taylor Instrument Cos., Rochester, N. Y. The new case is shallower, making it possible to see the mercury column through a wider angle of vision. The chromium-plated bezel fits snugly into the grooved case in such a way as to hold the thick glass front securely against four wavy tension springs which are fastened securely under the scale by shakeproof screws. The construction is said to result in a dustproof, rattleproof and practically fumeproof thermometer capable of withstanding vibration and severe shock. The new instrument is equipped with this company's easy-reading Binoc tubing and can be supplied in many combinations of straight and angle stems, with threaded or union connections, and in many standard temperature scales between —40 and +750 deg. F.

EQUIPMENT BRIEFS

FOR TESTING purposes American Coils Co., 25 Lexington Ave., Newark, N. J., has introduced a new humidity test chamber, consisting of one of this concern's low and high temperature test chambers, to which an attachment for humidity control has been added. The standard humidity range is ambient to 140 deg. F. and ambient to 90 percent relative humidity. If desired the manufacturer can provide for humidities below ambient. Important features include large usable space, quick pull-down, two-stage refrigeration, positive air circulation, and uniform automatic control.

SEVERAL new gasketing and sealing materials, which are alternates for various forms of rubber, have been announced by Felt Products Mfg. Co., 1504 West Carroll Ave., Chicago, Ill. Included is a reclaimed rubber strip and gasket material designated as R-196, said to have good resistance to water, compression and abrasion, where high tensile strength and tear resistance are not essential. For more severe conditions the company has developed a synthetic ma-

terial called Syntoflex, which is suitable for contact with a variety of oils, fuels and chemicals. As an alternate for sponge rubber, a felt base especially impregnated with synthetic rubber is now produced which stimulates the spongy characteristics of sponge rubber stripping.

To ENABLE treatment to be applied quickly in the case of burns, the Gebauer Chemical Co., Cleveland, Ohio, has introduced a stable tannic acid solution which is supplied in a bottle provided with a spraying device for spraying the solution directly from the bottle on to the burn. According to the manufacturer, the first five minutes after a burn are the most important in treatment, and if first and second degree burns are treated promptly, the probability of blistering and infection is materially reduced.

ANNOUNCED jointly by the Shell Oil Co., 50 West 50th St., New York, N. Y., and the Canister Co., Phillipsburg, N. J., is a new container which is expected by the manufacturer to save many millions of pounds of essential metals annually in the packaging of a wide variety of products. The oil company has already introduced the container in initial quantities to the public as a motor oil package. The container is made up entirely of non-critical materials, including fiber, parchment paper and adhesives. The manufacturers anticipate that the new can may supplant tin cans to some extent in the future when metals are no longer critical.

A NEW portable filter-type dust collector known as the Bargar Safe-Aire has been announced by the Bargar Sheet Metal Co., Cleveland, Ohio. The machine is designed for direct attachment to the source of dust. It has a capacity of 600 c.f.m., and separates the dust from the air, blowing the clean air directly back into the room where it is installed, thus avoiding the loss of heated air in winter.

SINCE many government paint specifications now call for infra-red reflectivity, the Stewart Research Laboratory, 1340 New York Ave., N.W., Washington, D. C., has developed a series of permanent and washable standards for infra-red reflectance. These are made of metal, coated with a durable baked enamel, and are sold in sets of three, corresponding to the three levels of infra-red reflectance used in U. S. Army specification No. 100-12. The standards are stated to be accurate within plus or minus 0.5 percent. They are suitable for direct photographic comparison or for reflectometric measurements.

MOTOR STARTER

TYPE H is the designation of a newly designed motor starter built to withstand severest wartime operating conditions, which has been announced by Allis-Chalmers Mfg. Co., Milwaukee, Wis. Designed for low first cost, the new starter is a metal-inclosed structure similar to metal-clad switchgear. High interrupting capacity disconnecting-type fuses are utilized, in combination with a heavy-duty oil switch. These starters are used for full or reduced voltage starting, dynamic braking, reversing and special applications, and are available for motors rated to 1,000 hp. at 2,300 volts, or 1,750 hp. at 4,600 volts. The new starters protect motors from sustained overloads, locked rotor conditions, single-phasing, and overloading caused by two frequent starting. This protection is supplied by an accurately calibrated thermal overload relay.

TOTALLY INCLOSED MOTOR

DESIGNED for use under conditions where abrasives, chemicals, rain, snow, and excessive dirt are encountered, a new line of totally inclosed motors which are the most recent addition to its line of Tri-Clad motors has been announced by the Motor Division of General Electric Co., Schenectady, N. Y. The new line is available in both the polyphase, 60-cycle, induction type, and the single-phase, 60-cycle, capacitor type. These motors include various sizes from ½ to 2 hp., for various speeds from 900 to 3,600 r.p.m. Their mounting dimensions are interchangeable with Tri-Clad open motors of the same rating. They feature protection against physical damage, electrical breakdown and normal operating wear and tear. In addition, all parts of the inclosure are of cast iron to provide a high degree of resistance to corrosion and accidental blows. Rotating labyrinth seals are provided to prevent dirt, oil and water from entering the bearing housings.

AUTOMATIC END-DUMP HOPPER

FOR THE HANDLING of small objects, as well as a wide variety of granulated, lump and pulverized materials, the new model No. 4004 automatic end-dump, caster-mounted hopper has been announced by H. L. Pitcher Co., 12400 Strathmoor, Detroit, Mich., exclusive sales agents for the Rose Mfg. Co., of Detroit. As shown in the accompanying illustration, when the latch is released and the load is dumped, the bucket is so balanced that it automatically returns and latches in position when reloaded. It rides empty in the balanced position. Mounted on heavy-duty all-steel casters, it is built of structural steel and heavy plate and is designed to fit any kind of lift truck. The three views show the hopper after dumping its load, in the empty position, and in the loaded position.

Totally inclosed Tri-Clad motor

NEW A.C. WELDERS

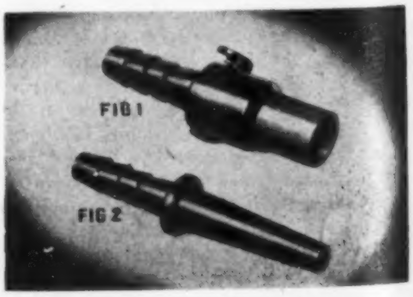
To EXPAND its welding equipment service to war industries, Harnischfeger Corp., Milwaukee, Wis., has developed a complete line of industrial a.c. arc welders to supplement its present extensive line of a.c machines. The new machine is produced in seven heavy-duty and four intermittent-duty models, with a range of capacities for handling production welding under continuous operation. Setting and control of current throughout the complete welding range involves one simple adjustment. The control is said to be creep-proof, while other improvements and electrical refinements are claimed to show an increase in operating efficiency to as high as 95 percent, with appreciably reduced maintenance cost.

PLASTIC HOSE NOZZLE

Two NEW molded plastic nozzles for industrial fire extinguishing equipment have been announced by American Molded Products Co., 1751 North Honore St., Chicago, Ill. These nozzles are claimed to be strong, durable and light, and a suitable replacement for critical metals. They are corrosion-proof, non-bending, and resistant to alkalies and acids. Two types are shown in the accompanying illustration. Fig. 1 is a nozzle for two-way or split stream, to form a spray when needed, as in fighting incendiary bombs. This nozzle can also be used for a one-way stream by depressing a thumb-spring. Fig. 2 is a one-way straight-stream nozzle consisting of a one-piece molding. Both types are furnished for standard hose sizes of fire extinguishers, stirrup-pump hose, and similar fire-fighting equipment.

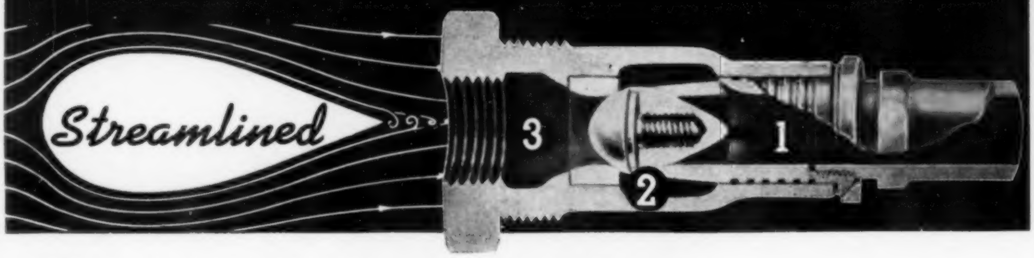
Automatic end-dump hopper

Plastic nozzles for fire extinguishers



STRAIGHT LINE FLOW

- to insure maximum capacity
- for close delivery pressure control
- to save operating and maintenance cost

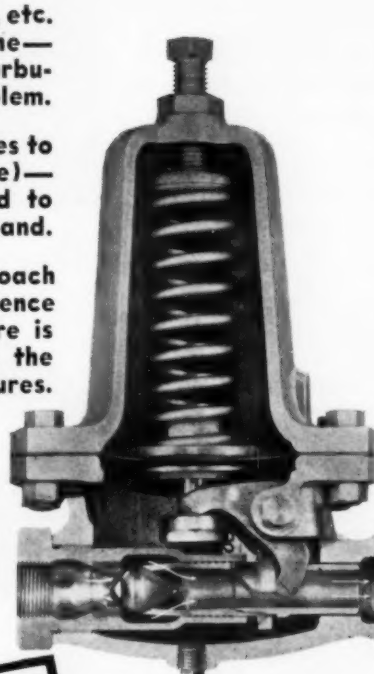


❶ Straight Line Flow: Steam, water, air, oil, etc. flow through this valve in a straight line—nothing is in the path of flow to cause turbulence—therefore, peak flow is never a problem.

❷ Inner valve is streamlined—no back eddies to hinder flow (see streamlined form above)—valuable when you want all possible fluid to go through the valve to meet peak demand.

❸ Turbulence eliminated by venturi approach to the valve seat. This eliminates turbulence—it means better flow. The inlet pressure is confined to a small cylindrical chamber, the same being advantageous for high pressures.

★ The "1000" valve is single seated and its valve makes line contact with its seat ring which accounts for its tight closing characteristics. The unusually long diaphragm spring insures sensitive pressure control.



CASH STANDARD *Streamlined* PRESSURE REDUCING VALVE
TYPE 1000

Write for Bulletin 1000 to get details on this Streamlined Valve for smooth even flow of steam, water, air, oil, etc.

- Trouble-free service
- Smooth operation
- Tight closure
- Accurate regulation
- Elimination of failures
- Constant delivery pressure
- No spoilage
- Maintenance needs practically zero
- Speedier production results
- Cost-saving operation

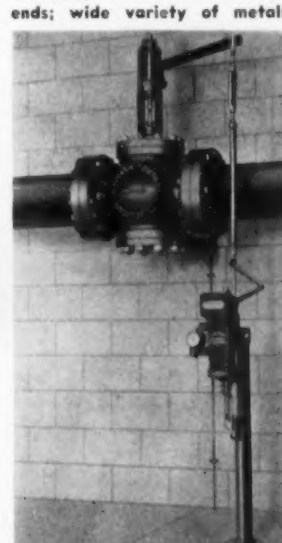
CASH STANDARD
CONTROLS.. VALVES

A. W. CASH COMPANY
DECATUR, ILLINOIS

OTHER VALVES *from the* CASH STANDARD LINE

Cash Standard Type 30-AP Valve gives precise control of fluid pressures, through a pilot connected to the pressure under control. For steam, water, air, and most fluids.

Can be a pressure reducing valve or a back pressure valve depending on the way the control lines are connected. Pressures up to 600 lbs. Sizes ½" to 12" screwed; 1" to 12" flanged ends; wide variety of metals.



The Cash Standard Type 100 Controller above is operating an 8" Type 42-R Balanced Valve, automatically reducing 250 lbs. down to 125 lbs. pressure, handling 200,000 lbs. steam per hour.

Type 100 Controllers have lots of operating power, enough for any size valve; are fully compensated; have adjustable range; are very sensitive. Bulletin 963 covering the Controller and Bulletin 965 covering the Valve give complete and interesting details. Write for them.

☆

Stearic Acid, Red Oil and Glycerine

PRODUCERS of stearic acid, red oil and glycerine obtain them from natural fats by hydrolysis followed by distillation and/or fractional crystallization. All three operations are used at the Dover, Ohio, plant of the W. C. Hardesty Co.

After the albuminous impurities in inedible beef tallow have been coagulated by adding 60 deg. Bé. sulphuric acid and heating with a jet of steam, the tallow is split by the twitchell process. Each saponifier holds a tank car of tallow, 40 percent as much water, 1 to 1.5 percent of sulphuric acid and 0.7 to 1.5 percent of twitchell reagent. A 12-hour boil brings the system into equilibrium, with the tallow about 89 percent converted to fatty acids and glycerine. The underlying "sweet water" is then sent to the glycerine department where it is limed to neutralize the sulphuric acid, treated with aluminum sulphate to coagulate any residual albumen and put through two vacuum evaporators. The final product, after removal of precipitated calcium sulphate, is 88 percent saponification glycerine.

Meanwhile, fresh water and sulphuric acid have been supplied to the saponifier; and a second boil carries hydrolysis to within a few percent of the theoretical. The resulting fatty acids are vacuum steam distilled in a continuous bubble tower. Bottoms from the still are stearine pitch.

The distilled fatty acids are pumped into pans and allowed to solidify (slowly, for good crystals) to form 14-lb. cakes. After being chilled to about 40 deg. F., the cakes are wrapped in burlap and pressed in hydraulic presses. The liquid acids squeezed out—principally oleic—constitute red oil.

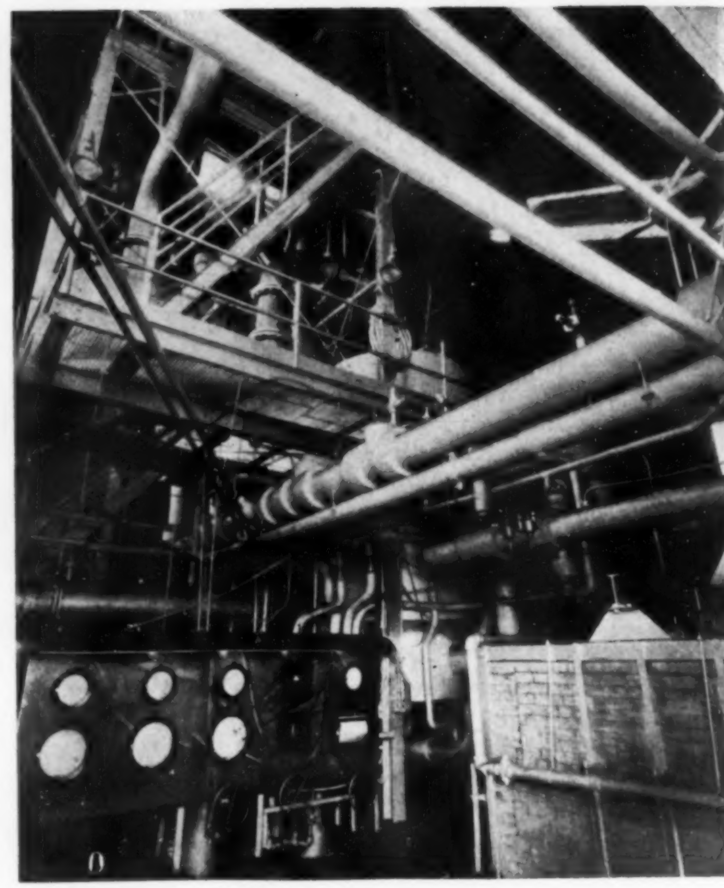
Solid stock from the cold presses is panned again and pressed in steam-heated presses. Length of the steam application depends on the grade of material desired. The press cake remaining is commercial stearic acid—actually a blend of stearic and palmitic acids in about equal proportions, together with a trace of myristic and from 2 to 12 percent of oleic. In making the better grades of stearic, the soft edges of the press cake are trimmed off by hand. Trimmings are recycled to the hot presses, liquid foots to the cold presses.

As a final step, both red oil and stearic are acid-washed and treated with decolorizing clays and blacks. After filtration, red oil is put into drums or sold by tank car; stearic is sprayed into beads, pulverized into powder, or molded into cakes.

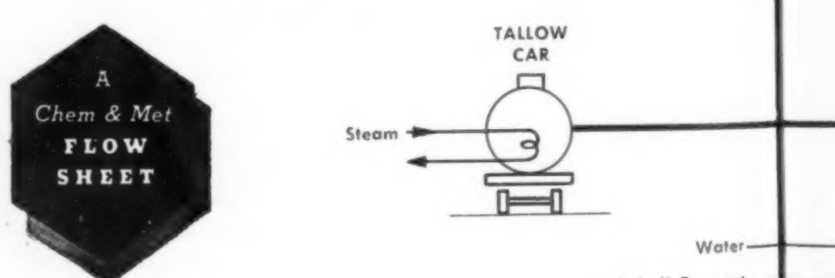
CHEMICAL & METALLURGICAL ENGINEERING

September, 1943

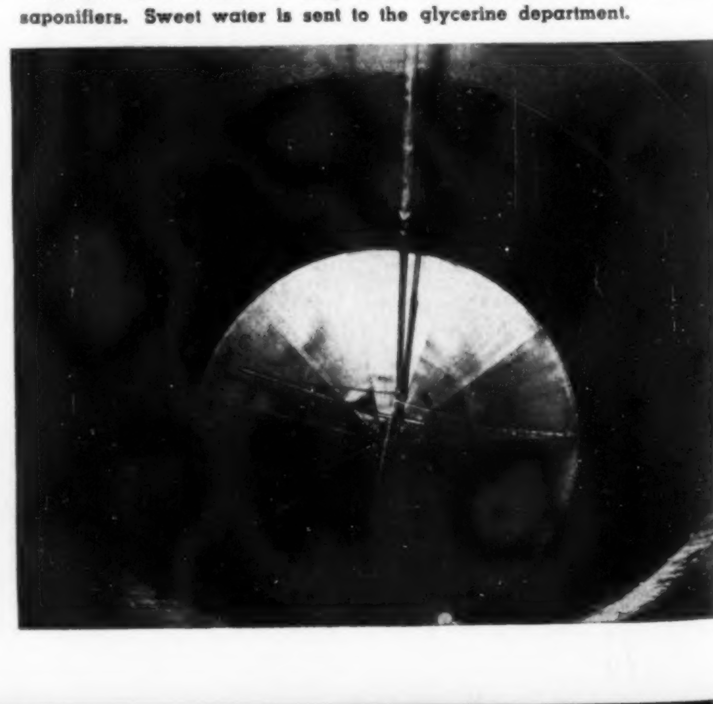
PAGES 132 to 135



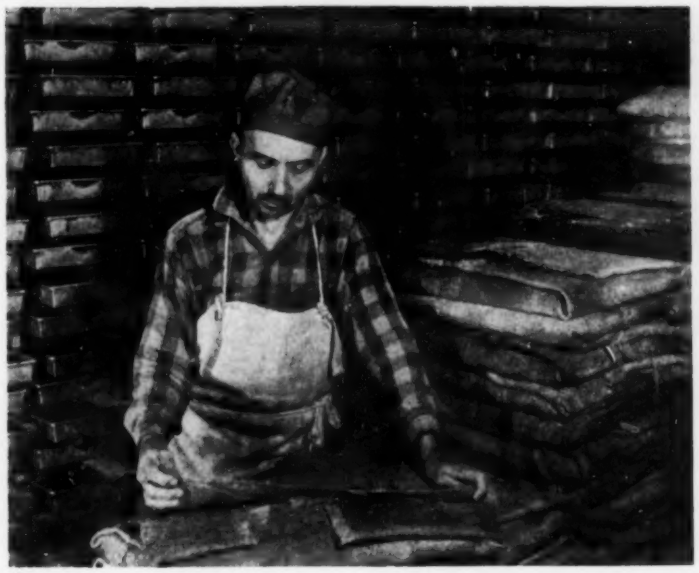
2 Resulting fatty acids are vacuum steam distilled in a continuous bubble tower at left. Condensing system is at top



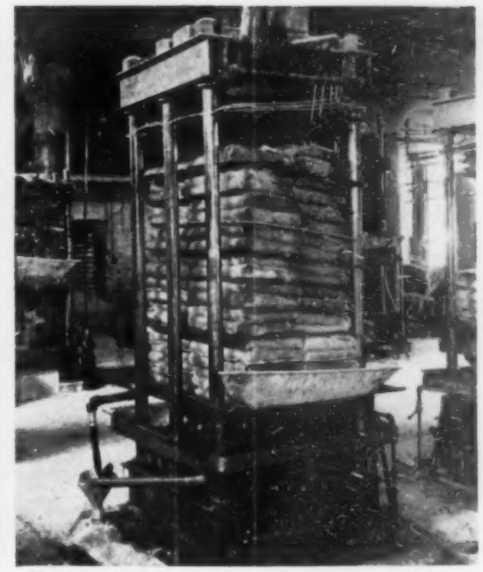
1 Tallow is converted to fatty acids and glycerine in cone-bottom saponifiers. Sweet water is sent to the glycerine department.



3 Fatty acids in aluminum pans are solidified in chill room at 40 deg. F.

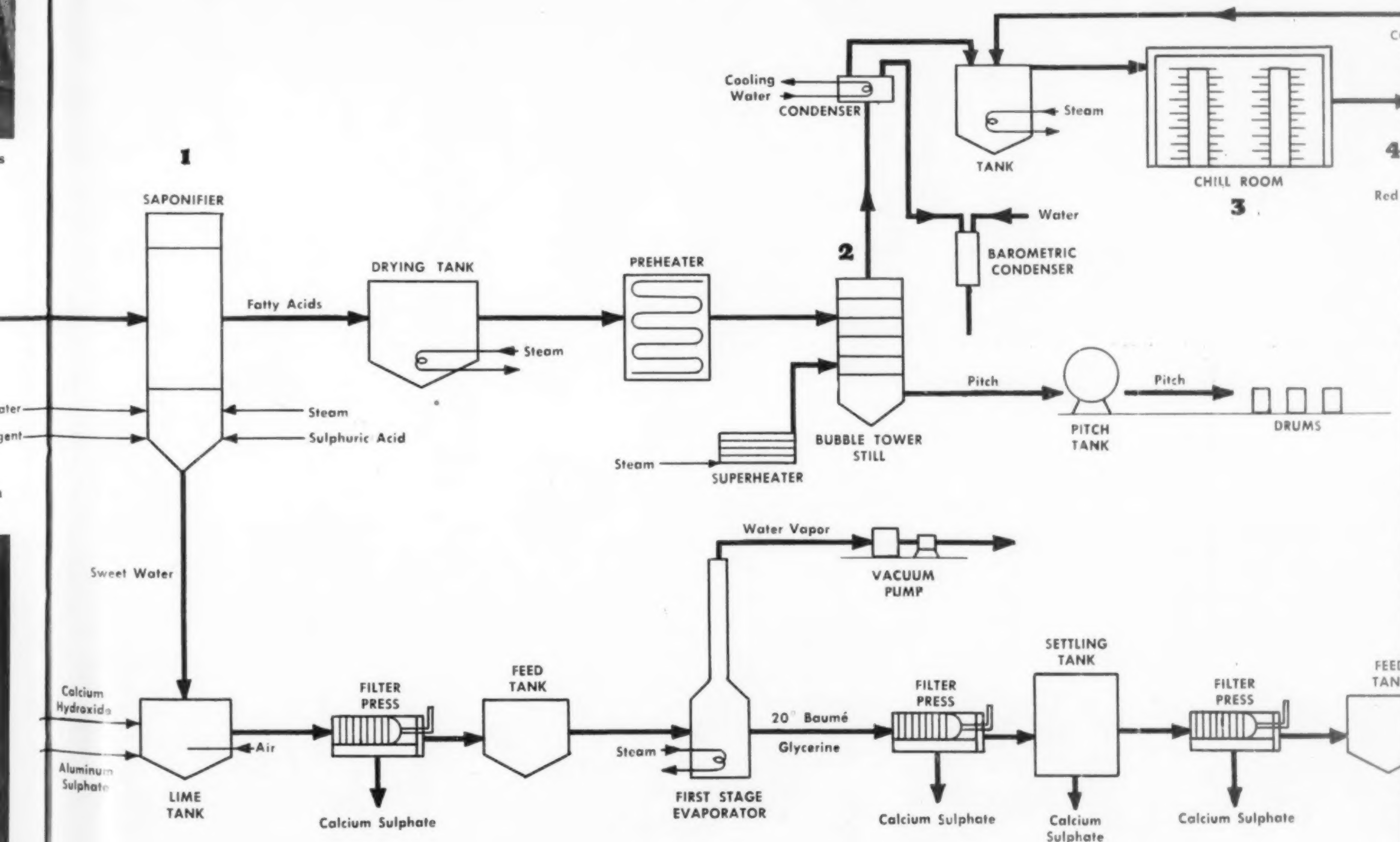


4 After being chilled the cakes of fatty acids are wrapped in burlap prior to pressing

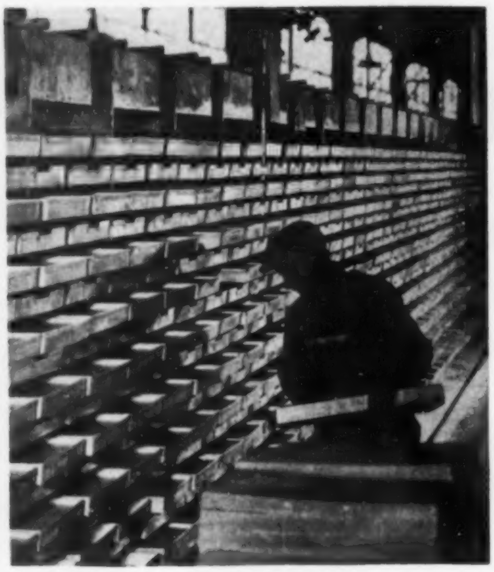


5 Wrapped cakes are placed in hydraulic press and red oil squeezed out

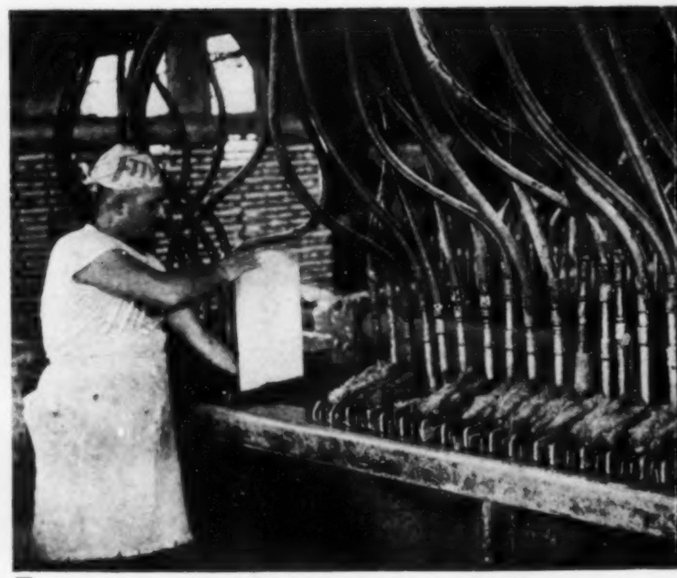
6 Remol
from pan



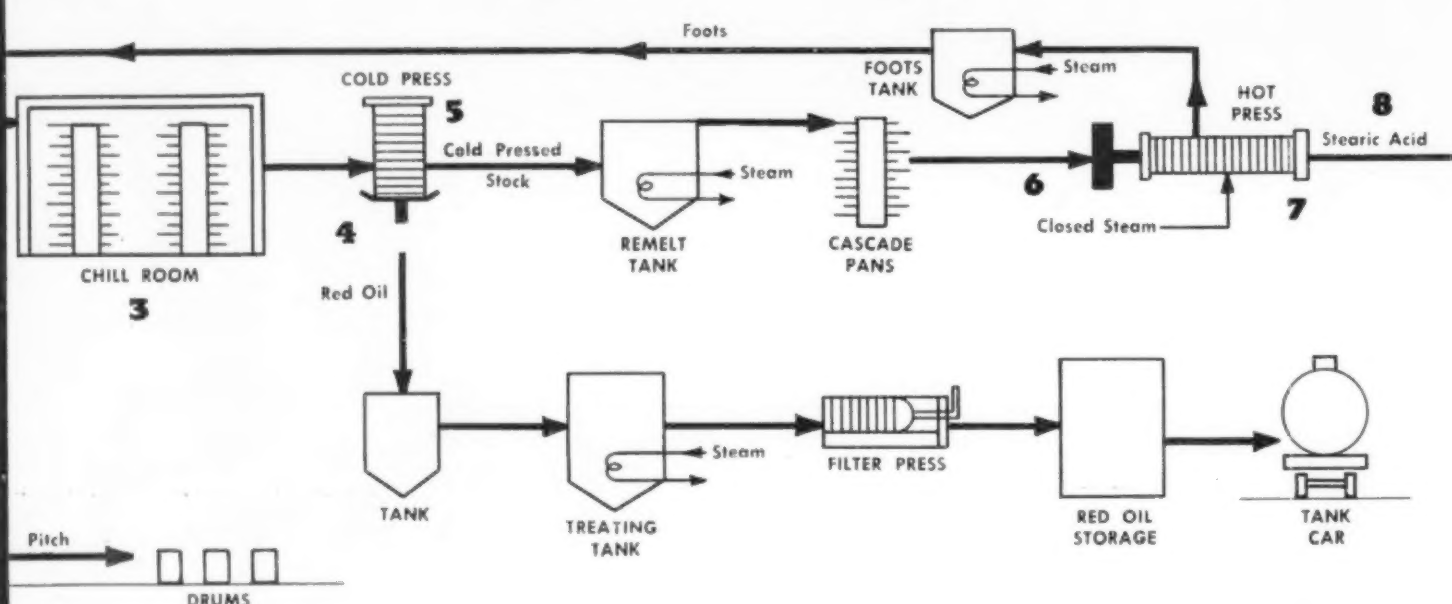
placed in hydraulic
eezed out



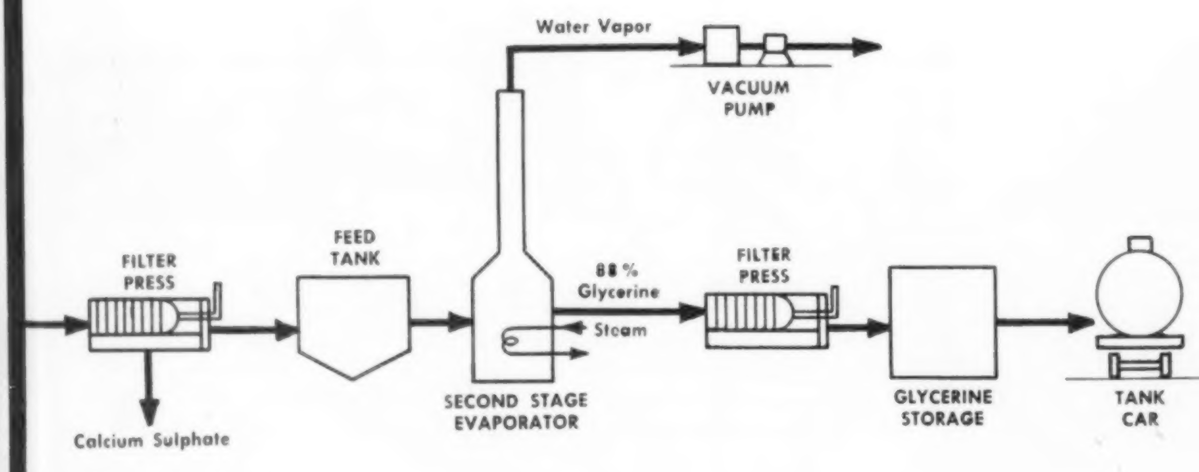
6 Remolded cold pressed stock is dumped from pans preparatory to hot pressing



7 Cakes are simply placed in camel's hair slings in a hot press. T
perature depends on grade of material desired.

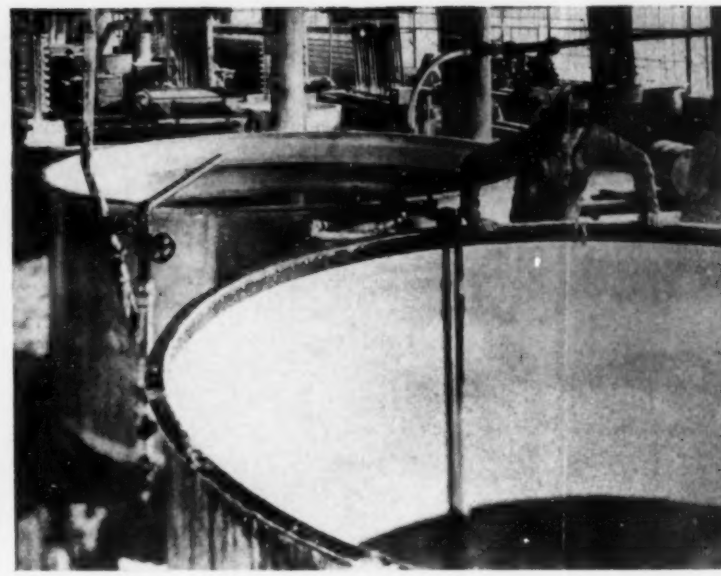


10 Decolorizing
aluminum filter pre

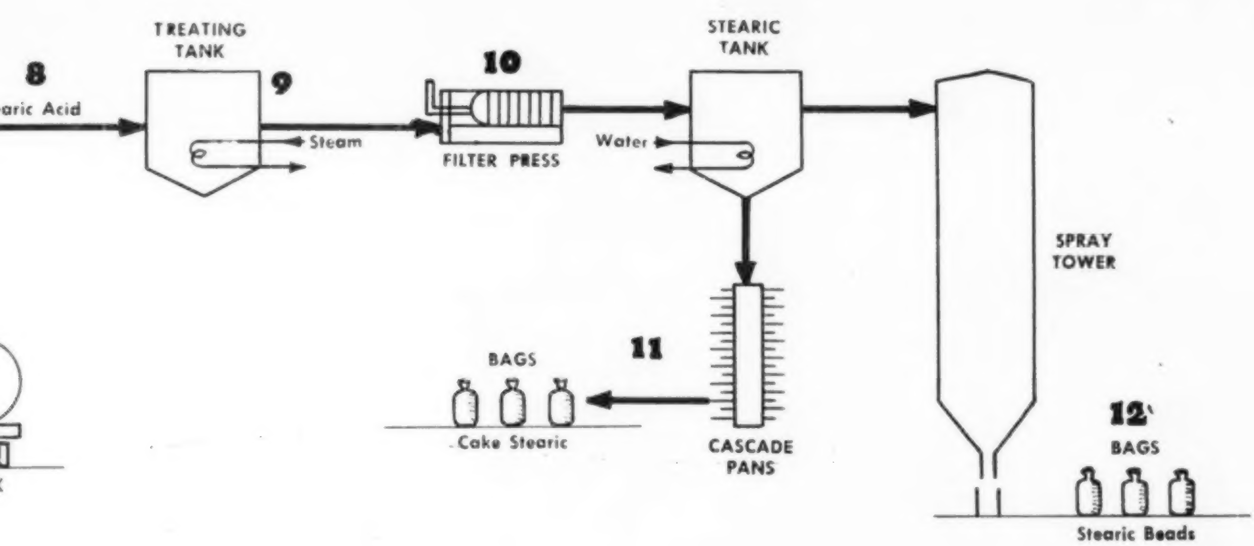


hot press. Tem-

8 Soft edges are trimmed from stearic acid cakes coming from hot press



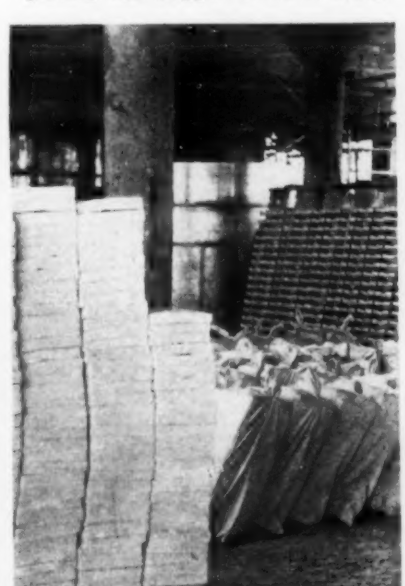
9 Stearic acid is acid washed and agitated with decolorizing clays and blacks in open tanks like the ones shown here



Decolorizing carbon is removed from stearic acid in um filter press fitted with paper backed with cloth

11 Cascade pans are in the background, and bagged cakes in center

12 As the product leaves the spray tower it is bagged for shipment




GIRDLER process
MAKES HIGH PURITY HYDROGEN AT LOWER COST
than any other known method!
PROOF of Operating Economy!
GIRDLER
SPECIALISTS IN BETTER GAS PROCESSES

Chemical Engineering NEWS

AMMONIUM NITRATE TROUBLES NOT FULLY SOLVED

USE OF ammonium nitrate as a fertilizer causes difficulty because of the tendency of this chemical to cake whether bagged alone or used as a component of a mixed fertilizer. Several processes have been developed for prevention of caking. One of these has been put into use by Hercules, employing a resin-base coating and an inert component such as kieselguhr. But even this most successful method has not yet fully met all the needs.

This situation is causing great concern because of the shortage of other nitrogen carriers. Thus far it has not proved feasible to get fertilizer companies or farmers to take all of the ammonium nitrate which could be supplied to them. This is true despite the impossibility of providing adequate quantities of other preferred fertilizer materials.

This Fall it appears that nearly twice as much ammonium nitrate could be made and distributed for fertilizer use as will be accepted willingly. Even more difficulty is being experienced with much of the Canadian production than with most of the domestic output. This, it appears, may prove a matter of serious official embarrassment later, since Federal officials have promised to take considerably more of this chemical from Canada than they seem able to dispose of in the form in which it is received. "The bagged product makes better tombstones than fertilizer" is but one of the unpleasant comments commonly heard in Washington discussions.

CONTRACT CANCELLATION PLANS MADE BY GOVERNMENT

MANY AGENCIES of the government realize that they must now quickly provide a basis for termination of contract dealings with respect to military supplies. From time to time, as stocks build up, such contracts have already been either terminated or suspended with great disadvantage to industrial enterprise. The government is anxious to avoid such general confusion and damage as would come from a continuation of the hit or miss policy which has prevailed to date.

To unify practice there has been organized an interdepartmental group under the Procurement Policy Board which works under the auspices of Division of Procurement Policy, War Production Board.

When a uniform policy has been formulated, after radical differences are adjusted between departments, individual firms will be able to learn where they stand with respect to contracts on which they are now working. Particularly, they can then determine what items will be allowed in costs and what will be excluded, what provisions for payment are to be made, and how subcontractor, surplus property, and other complicating questions are likely to be treated.

Until such agreement is reached, each firm will have to deal with the individual government agency with which it has contract relations; and the decision of that government agency will prevail.

C. E. ADAMS HEADS PULP AND PAPER COMMITTEE

CHARLES E. ADAMS, chairman of the board of directors of the Air Reduction Co. and U. S. Industrial Chemicals, Inc., has been selected as chairman of a committee formed under the joint sponsorship of the Combined Production and Resources Board and the Combined Raw Materials Board. The committee will ascertain and report in correlated form the facts concerning requirements and supplies, uses, production and distribution of products of the pulp and paper industries of the United States, Canada, and the United Kingdom. Canada is represented on the committee by Morris W. Wilson, president of the Royal Bank of Canada, president of the Montreal Trust Co., and director of the Pacific Railway Co. The United Kingdom is represented by Sir Clive Baillieu, British member of the Combined Raw Materials Board and a member of the British Supply Council in North America.

NEW CHEMICAL COMPANY WILL MAKE HYDROFLUORIC ACID

ANNOUNCEMENT was made last month of the formation of the Tulsa Chemical Co. at Tulsa, Okla. The newly created company will produce anhydrous hydrofluoric acid which is important in the war program because of its use in production of high octane gasoline. Interest in the company is divided among the Pennsylvania Salt Mfg. Co. of Philadelphia, the Mahoning Mining Co., Rosiclare, Ill., and the Ozark Chemical Co. of Tulsa. A plant is under construction at Tulsa and is expected to be in production next October. Officers of the company are president, George B. Beitzel, vice-president of Pennsylvania Saft Mfg. Co.; vice-president, C. C. Anderson, assistant to the president, Ozark Chemical Co.; treasurer, L. A. Smith, vice-president and treasurer, Pennsylvania Saft Mfg. Co.; assistant treasurer, C. M. Bush, assistant treasurer, Ozark Chemical Co.; secretary, S. H. Davis, vice-president, Ozark Chemical Co.

CHEMICAL SHOW WILL EXHIBIT NEW PROCESSING EQUIPMENT

MARVELS IN recent production of new substances by chemical methods only half disclosed thus far, have their counterpart in special processing equipment, concerning which almost no information has been revealed. This equipment had to be invented, planned and built before production for wartime uses could begin in a big way, yet much of it is still secret. Many details that may be revealed, however, including not a few bearing on postwar plans, will form a leading interest at the 19th Exposition of Chemical Industries, which will be held in Madison Square Garden, New York, Dec. 6-11.

Much of the information to be disclosed reflects either the creation of new industries and their products, or the conversion of existing plants to new uses. Plant conversion is an especially fruitful topic because the conduct of the war involves constant change while the war's end, however far away it may be, will involve sharp competition in the reconversion of hundreds of plants. Short circuiting the traditional "ten years from the laboratory beaker to the tank car" the chemical industries have crowded more than a decade of progress into a fifth of that time by concentrating the work of many specialists in different lines on such objectives as the volume production of synthetic rubbers and high octane gasoline, as well as the raw materials entering into them.

Many of the newer production processes now operated by the chemical industries require special processing equipment, but rapid advances are due in a great many instances to the adaptability to new uses of typical machines, tankage, retorts, stills, heat exchangers, piping and regulating appliances, such as have long been undergoing development throughout the wide range of chemical operations.

A central fact which highlights remarkable new achievements in the equipment field, is that many of the newer processes require far higher working temperatures and pressures than have been commonly used in the past, and involve the handling of more powerful corrosives and catalysts whose control is exceedingly difficult.

(*Continued on page* 144)

WASHINGTON NEWS

CHANGES IN the rules for the induction of men into the armed forces and controls established over the transfer of workmen to essential war jobs was War Manpower Commission's last attempt to relieve manpower shortages short of a national service act. If the program announced in August is successful, industry will be able to start the war production curve up again from the plateau it has been on for the last few months and by so doing will create a bigger need for products of the chemical industry than ever before. If the drive to get an additional 2,600,000 workmen to transfer from non-essential occupations into essential war jobs is successful, the critical labor condition at many chemical plants may be eased.

The program revises draft deferment regulations in an effort to get workmen into war jobs. Pre-Pearl Harbor fathers who are scheduled to be drafted starting October 1 have until that date to get into a job on the list of critical occupations or forfeit any claim to occupational deferment. The second part of the program is a tighter control on the transfer of workers aimed to keep men in essential jobs they may hold and to direct the transfer of men from non-essential occupations into the critical.

The plan revolved around the newly created list of critical occupations covering the skills most urgently needed by war industries. Employment at one of the critical occupations in a war industry practically assures deferment. However, the local board still has power to act as it sees fit. This is clearly brought out in the Local Board Memorandum which states: "The inclusion of the registrant's employment in Activity and Occupational Bulletins, or exclusion therefrom, does not conclusively determine his occupational status."

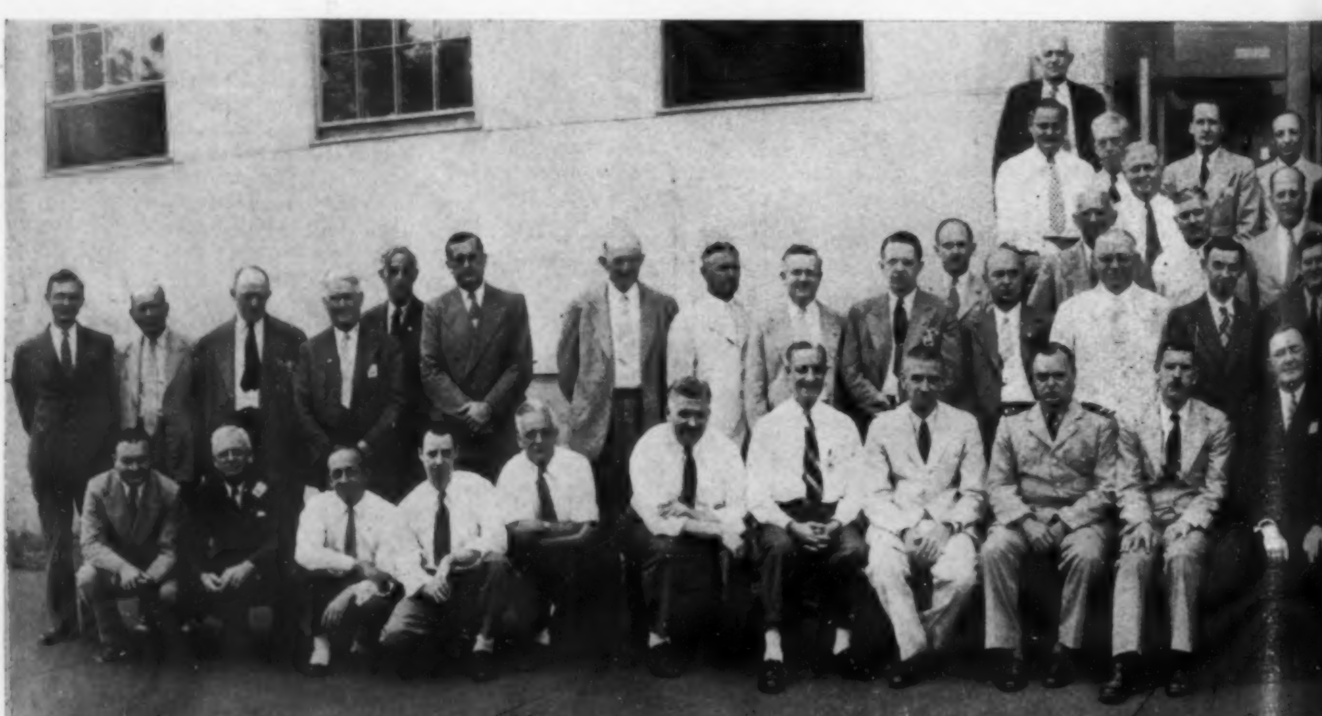
Concerning the list of critical occupations the memorandum reads: "The list of Critical Occupations is prepared by the War Manpower Commission and includes occupations requiring long experience and in which a national shortage exists or would exist if any substantial number of such persons qualified in those occupations be withdrawn from the labor market. It is imperative that registrants engaged in critical occupations in war production or in support of the war effort should be given grave consideration for occupational deferment by the agencies of the Selective Service System. Administrative action will be taken to insure such consideration by the Selective Service System."

Along with the list of critical occu-

Officials of Chemicals Division of War Production

Left to right, first row: M. E. Clark, chief, Program Section; Edward Casey, chief, Coal Tar Unit, Aromatics and Intermediates Section; Eugene Gysbers, sr. industrial specialist, Nitro-Ethyl Cellulose Unit, Protective Coatings Section; John Hostetter, chief, Glass Unit, Inorganics Section; Joseph Houghton, chief, Chemical Machinery Unit, Facilities Section; John Rodda, acting chief, Insecticides and Fungicides Unit, Inorganics Section; James Lawson, chief, Facilities Section; John Boyer, chief, Alcohol & Solvents Section; Lt. Comdr. Colgate, Navy representative; Lawrence Brown, assistant director; C. E. Wilson; Dr. D. P. Morgan, director; Donald Nelson; Dr. Walter G. Whitman, assistant director; Lt. Col. W. F. Sterling, Army representative; Fred J. Stock, chief, Drugs and Cosmetics Section; Willing B. Foulke, Sr., industrial specialist, Chemical Projects Unit, Facilities Section; Vernon Bishop, sr. industrial analyst, Chemicals Projects Unit, Facilities Section; Benton Wilcoxon, chief, Chemicals Projects Unit, Facilities Section; Justin Lewis, assistant economist, Chemicals Projects Unit, Facilities Section; Joseph A. Mathews, chief, Vitamins Unit, Drug and Cosmetics Section; Roy S. Koch, senior economist, Drugs and Cosmetics Section; Thomas J. Starkie, acting chief, Pigments and Color Unit, Protective Coatings Section.

Second Row: James B. Allen, acting chief, CMP Policy and Procedure Unit, Distribution Section; John A. Cullin, industrial analyst, Chemicals Projects Unit, Facilities Section; Turner F. Currens, chief, Botanicals, Essential Oils and Imports, Drugs and Cosmetics Section; Andrew Ross, industrial specialist, Facilities Section; George Taylor, chief, Statistics Unit, Program Section; R. C. Nuttman, industrial specialist, Chemical Machinery Unit, Facilities Section; Rolland H. French, chief, Grain Distilled Spirits Unit, Alcohol and Solvents Section; Frank E. Bennett, chief, Industrial Alcohol Unit, Alcohol and Solvents Section; Donald Knapp, chief, Packaging Unit, Resources Section; Frank Talbot, deputy chief, Program Section; Robert Ruark, chief, Plasticizers and Glycols Unit, Aromatics and Intermediates Section; E. Kenneth Burger, chief, Supply and Requirements Unit, Program Section; Wells Martin, assistant chief, Protective Coatings Section; Anthony Sedenka, chief, Plant Facilities Unit, Facilities Section; Harry Mitnick, asst. industrial analyst, Chemicals Projects Unit, Facilities Section; Hugh D. Hughes, director, Commodities Bureau; Sheldon Clement, sr. industrial specialist, Fertilizer Materials Unit, Inorganics Section; J. C. Leppart, chief, Chlorine-Alkali Unit, Inorganics Section; George Sollenberger, industrial specialist, Thermoplastics Resins Unit, Plastics Section; E. Bennett Bradshaw, chief, Solvents Unit, Alcohol and Solvents Section; Frank Carman, chief, Plastics Section; Edward Kent, industrial analyst, Chemicals Projects Unit, Facilities Section; Richard Connolly, assoc. industrial analyst, Chemicals Projects Unit, Facilities Section; Edgar Pear-



pations, WMC issued an expanded list of 60 non-deferable jobs and 58 non-deferable activities. Men of military age in these jobs or activities will be called up first regardless of dependency status or importance to the business.

WMC added a new provision to previous labor stabilization plans to permit a man to change from one essential job to another. They are to receive certificates of availability if they wish to leave employment where the wages or working conditions are below standards set by Federal or State regulation, or if the wages are below the level approved by NWLB. Companies with substandard wage scales are in a bad spot no matter what line of work they are in.

At the time the War Manpower Commission announced its work or fight edict it also took occasion to reissue its lists of essential activities including the amendments that have been made. The list for the chemical industry reads as follows: "Production of Chemicals and Allied Products and Essential Derivatives Thereof: Glycerin, turpentine, rosin and other naval stores; wood tars, oils, acids, and alcohols; plasticizers; lubricating oils and greases; animal and vegetable oils; fertilizers; tanning materials; chemical pulp; salt; synthetic rubber; coal-tar products; plastics; compressed and liquefied gases; refined sulphur; acids; caustic and other sodas; alcohols; electrochemical and electrometallurgical products such as carbide, sodium and potassium metals and high-percentage ferro-alloys; drugs and medicines; insecticides and related chemical compounds; synthetic textile fibers; grease and tallow. (Explosives, flares, and other fireworks, generally classified as chemical products, are included with ammunition.) Paints and protective coatings for military, naval, and marine materials, ships and equipment, for agricultural and industrial material and equipment, for container linings and electrical insulation; protective coatings for textiles; distillation of gums and saps."

FERTILIZER CHEMICALS

A recommendation that 1,000,000 tons of Chilian nitrate be imported in the next fiscal year was made by the Chemical Division of the War Production Board in late August. This is in line with recommendations made by the Fertilizer Industry Advisory Committee of the War Food Administration which has asked for the same amount on a number of occasions. They pointed out that the supply of sodium nitrate in the country has not been sufficient to meet the demands for a number of years.

The actual amount of nitrates that will be imported from Chile has been estimated at various amounts from 500,000 tons up. It seems probable that a figure in the neighborhood of 800,000 tons will probably be imported before the end of the fertilizer year, June 30, 1944. Nelson Rockefeller's Office of Inter-American Affairs has recommended that 780,000 tons be imported and is working hard to see that this goal is reached.

Proponents of the importation of less nitrate from Chile suggest that half of the nitrogen requirements of this country could be supplied in the form of excess ammonium nitrate from powder plants. The drawback to the use of ammonium nitrate is that the industry

Board with Donald Nelson and Charles E. Wilson

son, chief, Cellulose Unit, Aromatics and Intermediates Section; J. N. Hall, chief, Transportation Unit, Resources Section; Thomas J. Craig, chief, Protective Coatings Section; B. M. Belcher, chief, Paint, Varnish and Lacquer Unit, Protective Coatings Section; John Batson, chief, Medicinal Chemicals and Biologicals Unit, Drugs and Cosmetics Section; William J. McManus, chief, Plant Requirements Unit, Drugs and Cosmetics Section; Floyd K. Thayer, consultant, Drugs and Cosmetics Section; Harry J. Schnell, sr. industrial analyst, Compressed Gases Unit, Inorganics Section.

Third row: Harold Naisawald, chief, Molasses Unit, Alcohol and Solvents Section; Paul Corbin, chief, Coated Fabrics Unit, Protective Coatings Section; Lawrence C. Leonard, chief, Distribution Section; W. G. Hughes, industrial analyst, Chemicals Projects Unit, Facilities Section; J. W. Wizeman, chief, Inorganics Section; R. R. Hull, consultant, Inorganics Section; John McDonnell, chief, Research and Statistics Unit, Drugs and Cosmestics Section; R. P. Kenney, industrial analyst, Vinyl Resins Unit, Plastics Section.

Fourth row: Raymonds K. Webster, consultant, Protective Coatings Section; Coleman Caryl, chief, Associated Materials Unit, Protective Coatings Section; Charles A. Willard, deputy chief, Drugs and Cosmetics Section; Clinton Rector, chief, Thermosetting Resins Unit, Plastics Section; Louis L. Newman, chief, Maintenance and Repair Unit, Facilities Section; Lackland Beeding, industrial analyst, Chemicals Projects Unit, Facilities Section; Page Blakemore, chief, Acids and Salts Unit, Inorganics Section; E. M. Houts, principal industrial specialist, Office of the Director; David L. Watson, chief, Foreign Requirements Unit, Program Section; Charles M. Rice, principal industrial specialist, Office of the Deputy Director; Herman Zouderer, assoc. industrial analyst, Chemicals Projects Unit, Facilities Section; G. H. Peters, Nitro-Ethyl Cellulose Unit, Protective Coatings Section; William J. Canary, chief, CMP Processing Unit, Distribution Section; Donald Vivian, senior economist, Statistics Unit, Program Section; Harry Howard, chief, Aromatic Petroleum Solvents, Protective Coatings Section; Eugene Harwood, assoc. industrial analyst, CMP Policy and Procedure Unit, Distribution Section; Arthur Wilkinson, industrial specialist, Chemicals Projects Unit, Facilities Section; L. W. Himmler, industrial specialist, Maintenance and Repair Unit, Facilities Section;

Fifth row: H. H. Custis, sr. industrial specialist, Supply and Requirements Unit, Program Section; Nils Anderson, chief, Adhesives Unit, Plastics Section.

has not yet been able to put it into mechanical shape for the best use.

Superphosphate production is being stepped up monthly. In the 1942-1943 fiscal year approximately 5,600,000 tons (basis 18% P_2O_5) was produced. Prospects for the coming fiscal year are for a production of over 6,000,000 tons, with requirements estimated to be 6,600,000 tons. Quantities considerably in excess of this amount are being considered. However, no larger figure had been officially announced by the Requirements Committee on September 1. An important consideration of any revision of estimates would be the ability of the industry to produce any additional superphosphate under the present conditions of manpower, equipment and material.

If this production goal is to be reached, the industry will require approximately 500,000 additional tons of 50 deg. sulphuric acid. Capacity for the production of sulphuric acid apparently is sufficient to take care of a considerable additional load. The difficulty in the present instance is that existing surplus capacity is scattered. The short economic shipping range, together with a shortage of tank cars, seems to indicate that additional acid production facilities are required in shortage areas if the industry goal is to be approached.

In this connection, it is interesting that plans being made for new manufacturing capacity for sulphuric acid, superphosphate and other fertilizer chemicals envision expenditures of considerable magnitude during the next twelve months. These are future plans, not definite commitments. During the fiscal year which ends June 30, 1944, agriculture is expected to continue the trend toward greater consumption of mixed fertilizers. In that case the demand will be the greatest on record, which will require the prompt execution of plans for new productive capacity.

ALUMINUM PLANTS

Final determination of the advisability of adding to the nation's aluminum reduction capacity has been held up indefinitely. Apparently all the 10 percent excess capacity that was suggested as an insurance against future emergencies has already been built. It is reported that two reduction plants, one in Seattle and one in Los Angeles, are down through lack of manpower, but that in spite of it there is no shortage of pig aluminum. The tipoff on the situation is the controversy between the Army and the Office of War Utilities concerning the installation of an additional 108,000 kw. generator in Grand Coulee Dam. The Army wants to know why the additional generator capacity when there isn't labor enough to keep the plants going. The final decision will probably not be made until it is more definitely known how much higher the production of aircraft can be pushed. Until that time, any increase in aluminum production capacity will be held under wraps.

Capacity for the production of alumina is being increased now, regardless of what decision is made concerning the increased capacity for its reduction.

CHEMICAL EXPANSION

Contrary to the general trend and contrary to official statements construction of new facilities in the chemical industry will continue and quite likely will be greater in the year ahead than they were in the year just past.

Construction of plants for the manufacture of military items has about run its course. Early in August, WPB Chairman Donald Nelson reported with high satisfaction that four-fifths of the government-financed program had been completed at mid-year. In the field of chemicals, Mr. Nelson said the rate of expansion has been extremely favorable. Only 31 per cent complete a year ago, the chemical program had risen to 66 per cent at the beginning of 1943 and it was more than 90 per cent completed on July 1.

Certain scarcities will modify plans for establishing new facilities. These scarcities include labor shortages, shortages of raw materials, shortages of component parts, shortages that are affecting the civilian economy adversely, all of which must be considered.

The August 1 classification of labor market areas published by the War Manpower Commission added 43 cities to that list for the first time. Only 88 labor areas are designated as having a plentiful supply of labor. It is in these areas that the government will make efforts to place new contracts and to locate new production facilities.

In February the government announced that among the materials which had become more critical than in the previous two months' period were zinc, cadmium, chromium, benzol and derivatives, methyl alcohol and formaldehyde. Six weeks later the Conservation Division of the War Production Board announced that increased facilities for refining magnesium had made the supply of that metal easier, but that the rest of the non-ferrous metals had become tighter. At that time, it was stated that metals that had become more critical included bismuth, cadmium, tin and osmium. Chemicals that had become more critical in the same period included monoethanolamine, butyl alcohol (all isomers), phthalate plasticizers, citric acid, chlorates and perchlorates. In July the Conservation Division in its materials substitutions and supplies list said, "With the increasing prevalence of labor shortages, greater emphasis must be placed on the use of materials which are suitable to lower unit labor processes, such as stamping, die molding and die casting." Increased production made the position of magnesium much easier while ferro alloys particularly were somewhat easier. Among the chemicals that had grown more critical were phthalic anhydride and derivatives, phenolic laminates, ethyl cellulose, sulphuric acid and some others.

Since the scheduling of component parts was announced early in the year, users of these components have been able to deliver orders on time because the scheduling program was successful. The backbone of that plan was to get orders for the critical units on the manufacturers' books early so that the overall scheduling could be carried out. The bottleneck was broken, but the program for the manufacture of planes, ships, facilities for manufacture of 100-octane gasoline and synthetic rubber, all of which were in conflict, are still going on. New chemical plants requiring any of these critical components will be in direct competition with conflicting programs that were responsible for scheduling of component parts in the first place, and their requirements must be scheduled far in advance if they are to receive consideration.

ALCOHOL FROM MOLASSES

Late in August it became generally known in Washington that molasses would be brought in from the Caribbean area for the manufacture of industrial alcohol in the eastern seaboard plants.

This followed on the heels of the announcement of the sale of 4,000,000 tons of the 1944 Cuban sugar crop to Commodity Credit Corp. The United States will absorb a million tons more of Cuban sugar from the 1944 crop than they did from the 1943 to make up for the amount of cane sugar substituted for the corn sugar as a direct result of the corn shortage.

Accepted figure for the amount of molasses to be imported was 300,000,000 gallons. This amount would produce roughly 120,000,000 gallons of alcohol, saving approximately 50,000,000 bushels of wheat. Actually, the United States will buy all the molasses it can get providing necessary transportation is available.

Washington reaction was a sigh of relief that at last the government had embarked on a program that would produce low cost alcohol in quantity without using grain.

Certain officials in the Department of Agriculture explain at great length that there is no world shortage of grain, either corn or wheat. Their statement is perfectly true. The world supply of grain is at the greatest peak in history, only none of the excess happens to be in this country. The officials have not explained how a Baltimore distiller can use grain supplies that happen to be in South Africa, the Argentine or even as near home as western Canada.

Two questions have not been answered. The first is why the sudden change of heart. The second is how was the squeeze put on the armed services to get the tankers in the face of impending military operations of great magnitude.

In Washington it is evident that the government is edging nearer to a decision to release an undetermined quantity of alcohol for beverage purposes. The Gallop poll, often used by the government to check public opinion, has reported that the country leans to the wet side by a two to one majority. Political considerations being right for such a move, early action may be expected.

(*Continued from p.* 139)

Among exhibits at the forthcoming Exposition will be hard rubber equipment for handling corrosive chemicals, glass lined equipment, including an absorption tower required by the new acid catalytic petroleum reduction process, a heat exchanger section used in making synthetic latex, as well as new stainless steel reaction kettles, condensers, receivers and evaporating pans, and a new heat exchanger of flexible design using plates made in stainless steel, copper, bronze and Karbate.

Other new things include micro-porous porcelain filter media as well as surface and interfacial tension phase separators for liquids. Also fritted glassware filtering discs in five porosities, offered as a substitute for scarce asbestos. For dry separations, there will be shown air float and electrostatic appliances. Another display will illustrate the latest methods of dust and fume control.

There will be pumps capable of moving asphalt, molasses, glucose, acid sludge, white lead and many other liquids of high viscosity encountered by the chemical process industries. The latest developments in high speed suspended and underdriven centrifugals will be shown in operation. There will also be exhibited a new mechanical device for increasing the evaporative capacity of rotary steam tube dryers, which can be applied to dryers already in use. By contrast with specialties such as these, one exhibitor will demonstrate its ability to build and equip complete plants for the process industries.

FERTILIZER SUPPLY PLANNING SHOWS CONSTRUCTION NEEDS

RECORD demand for fertilizer to grow 1944 crops spotlights the need for some additional industrial capacity. In some parts of the country there are shortages of facilities for preparation of phosphate rock, or manufacture of sulphuric acid, or for making of superphosphate. These three defects may be met by some additional construction in Southeastern States this Winter. But even more important are some of the nitrogen process facilities for which glaring shortages exist.

A little surplus acid capacity exists in Northern States; but it is impractical to move acid from there to the fertilizer areas. The rock preparation facilitates needed are principally those for beneficiation and grinding. Only a small additional capacity is needed for manufacture of superphosphate and its use in making mixed goods. And all three of these shortages are spotty or localized.

Nitrogen supply for this fertilizer year which ends with June of 1944 should be at least 700,000 tons of contained nitrogen. To achieve that record supply in its estimates, the War Food Administration must assume that all of the chemical facilities contributing will be working under most favorable conditions. To be sure of that huge supply, many competent observers think that there should be a million tons of Chilean nitrate brought into the country.

E Awards

FOR PRODUCTION EXCELLENCE

Among the companies which, in the past month, have been awarded the honorary Navy "E" and joint Army and Navy "E" burgee for exceeding all production expectations in view of the facilities at their command, are included the chemical and explosives plants, the chemical process industries and the chemical engineering equipment concerns listed below. Other process and equipment plants will be mentioned in these columns as the awards are presented to the individual plants.

Allis-Chalmers Mfg. Co., LaPorte, Ind.
American Car & Foundry Co., Berwick, Pa.
American Cyanamid & Chemical Corp., Little Rock, Ark.
Apco-Mossberg Co., Attleboro, Mass.
Atlas Imperial Diesel Engine Co., Mattoon, Ill.
W. A. Baum Co., Inc., New York.
Bell Machine Co., Oskosh, Wis.
Belle City Malleable Iron Co., Racine, Wis.
G. H. Bishop Co., Chicago.
Buckeye Cotton Oil Co., Memphis, Tenn.
Camillus Cutlery Co., Camillus, N. Y.
Chicago Wheel & Mfg. Co., Chicago.
Copperweld Steel Co., Glassport, Pa.
Dewey & Almy Chemical Co., Cambridge, Mass.
Eitel McCullough, Inc., Salt Lake City.
Fansteel Metallurgical Corp., North Chicago.
S. W. Farber, Inc., Brooklyn.
Marshall Fields & Co., Spray, N. C.
Ford Motor Co., Richmond, Calif.
Fox Paper Co., Lockland, Ohio.
Gates Rubber Co., Denver, Colo.
General Machine & Mfg. Co., Berwick, Pa.
International Minerals & Chemical Corp., Carlsbad, N. M.
Jarecki Machine & Tool Co., Grand Rapids, Mich.
Charles Lennig & Co., Philadelphia.
Link Belt Co., Chicago.
McCormick & Co., Inc., Baltimore.
Modine Mfg. Co., Racine, Wis.
Murphy Elevator Co., Louisville.
National Standard Co., Worcester, Mass.
Nestle's Milk Products Co., Sunbury, Ohio.
New Irdia Quicksilver Mining Co., Idria, Calif.
Seymour Products Co., Seymour, Conn.
Simmons Co., Elizabeth, N. J.
Standard Wholesale Phosphate & Acid Works, Inc., Baltimore.
Steel Products Co., Inc., Savannah.
Tantalum Defense Corp., North Chicago.
Trackson Co., Milwaukee.
Trucson Steel Co., Cleveland.
Union Bleachery, Greenville, S. C.
John R. Wald Co., Milton, Pa.
Waterbury Clock Co., Waterbury, Conn.
West Michigan Steel Foundry Co., Muskegon, Mich.

MARITIME COMMISSION "M" AWARDS

The following companies have been awarded the Maritime Commission's "M" pennant, the maritime victory flag, and labor merit badges for the workers for excellence in production:

Buckley-Chapman, Portland, Ore.
R. D. Cole Mfg. Co., Newnan, Ga.
Gunderson Bros., Portland, Ore.
Kaiser Co., Inc., Vancouver, Wash.
Lake Shore Engineering Co., Iron Mountain, Mich.
The Lionel Corp., New York.
Moore Dry Dock Co., Oakland, Calif.
Permanente Metals Corp., Richmond, Calif.
E. H. Scott Radio Laboratories, Inc., Chicago.
W-K-M Co., Inc., Houston, Texas.
Walter Butler Shipbuilders, Inc., St. Paul, Minn.

appears that the Maritime officials are not going to give boat space for more than about two-thirds of that total. In another news item of this issue are indicated the ammonium nitrate troubles which threaten less-than-capacity supply and use of that chemical

Competent chemical engineers think that Washington must promptly provide considerable addition to the capacity of the country for making synthetic sodium nitrate. There is plenty of raw material, but not quite enough manufacturing capacity for making this competitor of the Chilean nitrate. Controversies over new plans for such plants have been vigorous and acrimonious recently. Perhaps the political engineering aspects have been even more prominent than the chemical engineering ones. At the end of August it was impossible to tell how many of the controversies would be settled, but it was clear that some strenuous prompt action was needed or the total nitrogen wanted for fertilizer will not be at hand when needed in fertilizer works.

INDUSTRY URGED TO SAFEGUARD FIRST AID FIRE APPLIANCES

THE managements of industrial and business establishments are urged, on the occasion of Fire Prevention Week, October 3-9, to give special attention to the care of first aid fire appliances. The use of critical metals for the manufacture of new extinguishers has been greatly curtailed, and practically the entire output of the fire extinguisher industry is going to the armed forces and to war plants with top priority ratings. It will be impossible, in many cases, to replace damaged or obsolete standard fire extinguishers until after the war.

Underwriters' Laboratories, Inc., and the Factory Mutual Laboratories, which test and permit labels of approval to be placed on various types of extinguishers meeting their standards of design and performance, have adopted Emergency Alternate Specifications for certain types of extinguishers in an effort to relieve the situation.

MONSANTO'S PHENOLIC RESIN PLANT WILL BE EXPANDED

CONSTRUCTON of additional manufacturing facilities for Resinox phenolic resins and molding compounds at Monsanto Chemical Co.'s plastics plant at Springfield, Mass., has been approved by the War Production Board, John C. Brooks, vice-president of the company announced last month.

The new facilities have been made necessary by an increased demand for high impact phenolic plastics compounds in war applications. Mr. Brooks said the increased capacity will be devoted entirely to high-priority war applications and will not relieve the critical situation on phenolic materials.

The present Resinox building at Springfield was completed in 1941 when all plastics manufacturing activities of the Monsanto company were consolidated at the Springfield plant.

READERS' VIEWS AND COMMENTS

WRITE YOUR CONGRESSMAN

To the Editor of Chem. & Met.:

Sir:—The National Patent Planning Commission has submitted its report to the President. This report stresses the fact that the "American people and their government should recognize the fundamental rightness and fairness of protecting the creations of its inventors by the patent grant." The report further emphasizes that "the basic principles of the present system should be preserved. The system has contributed to the growth and greatness of our nation. . ." Moreover, the report noted that the Commission was convinced "that the existing laws are adequate to protect the government during the present national crisis" and that no serious instances had been disclosed in which the patent system had had interfered with the prosecution of the present war.

Certain changes in the patent laws were recommended by the Commission. However, in the opinion of this writer—and without venturing at this time to pass upon the merits of the recommendations made—no one of them is of such an emergency nature as to require legislative consideration and action by Congress at a time when the energies of the country should be concentrated upon the prosecution and winning of the war and the solution of domestic problems connected therewith. Notwithstanding the Commission's recommendations and the opposition it indicated to certain changes in the patent laws urged from time to time, it would appear that some Senators and Congressmen are nevertheless going to flood Congress with bills which they favor incorporating their own ideas not only on patents but also as to research. In my opinion, an attempt at this time to jam through Congress so many ill-considered and ill-advised bills would cause irreparable harm to the nation, as they would raise controversial issues and dissipate a lot of energy and effort which should go into the war effort. Consequently, I believe that you should immediately urge your readers to write their Senators and Representatives, making suggestions along the following lines:

1. For the duration, consider only such emergency legislation as is necessary for specific war problems, and such emergency legislation should be limited to the duration of the war.
2. Steps should be taken to stop the campaign of discouraging and harassing not only inventors and patent owners but also members and proprietors of research organizations.
3. Steps should be taken to encourage and assist inventors and patent owners in every way to do their utmost in making inventions which will improve our war effort, to provide the incentive implied in the spirit of the Constitution and the letter of the law.
4. After the war is over, a joint committee of the House and Senate should be formed to take testimony throughout the United States from inventors, members of faculties of engineering and technical schools, officers and directors of scientific and technical organizations, manufacturers, those who finance research and commercialize inventions, and all others interested in our patent system, to ascertain what changes, if any, should be made in our patent laws, as well as what legislation, if any, should be enacted in connection with research.

A. W. Deller

WE HOPE YOU UNDERSTAND

If your copy of *Chem. & Met.* comes a little later than usual, we humbly ask for your sympathy and indulgence. Printers and publishers, too, have their manpower problems, which in the case of our paper mill go all the way back to the northern woods. Metal for engravings has been greatly restricted and we must work with substitutes and other devices of conservation. With it all, however, we are making progress and hope to continue without curtailing vital services beyond an occasional delay of two or three days. Furthermore, we are even optimistic enough to believe that measures we are now taking will help us to get back on schedule soon. Please bear with us a little longer. *Editors.*

THE COTTRELL ELECTRICAL PRECIPITATOR
OUTSTANDING FOR ALL HEAVY-DUTY, HIGH-RECOVERY DUST COLLECTING JOBS
GAS OUT
GAS IN
COTTRELL PRECIPITATORS ARE RECOGNIZED THROUGHOUT THE WORLD AS THE MOST EFFICIENT METHOD YET DEVELOPED FOR RECOVERING ANY TYPE OF SUSPENSION FROM GASES, HOT OR COLD.
Regardless of the particle size or nature of the suspension - whether dust, fog, fume, mist, smoke or any other dispersoid, the Cottrell can be guaranteed to collect 99% or over of ALL particles entering the system. Even on ultrafine particles, Cottrell efficiencies are well above 99.9%, closely approaching theoretically perfect performance!
The Cottrell Precipitator separates suspensions from a gas by ionization with a high voltage field. There are no filters, no screens, in the collector...nothing to require frequent repair, replacement or maintenance. Draft losses are lower than on any other type of collecting equipment. Gases at any temperature to 1200°F., and higher, can readily be handled...and in any capacity, even millions of cubic feet per minute. And power costs are extremely small, averaging only a fraction of a k.w.h. per 100,000 cubic feet of gas cleaned!
Whether your dust or fume control problem involves purification of gases, collection of "values", or nuisance abatement, for maximum recovery efficiency, long-life and maintenance-free operation, the logical choice is a COTTRELL!
A COTTRELL installation generally pays for itself within a few months —always within a few years—in the "values" it recovers...
In one mining smelter alone, a Cottrell recovers over a MILLION dollars a year in gold, silver and other metallic dusts from waste gases!
Cottrell installations in cement plants are recovering thousands of tons of cement kiln dust daily from waste gases, not only turning this former loss to a profit but also safeguarding surrounding areas against dust deposition and contamination!
Another Cottrell installation in an acid plant recovers sulphuric acid mists at a rate of over 2,000,000 pounds of acid a year!
These are typical of the many important savings Cottrell Precipitators are making in dozens of widely varying industries—conserving strategic materials vital to the war effort and minimizing losses in production processes. Let our engineers study YOUR recovery problem!
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INTERPRETING WASHINGTON

CONTENTS

Steel Pipe 149
Heat Exchangers 149
Employee Safety Equip 149
Fibre Drums 149
Used Steel Shipping Drums.......... 149
Anti-freeze Materials 149
Soap Stocks 149
Hides 149
Ethyl Alcohol 149
Coal Tar Products 150
Calcium 150
Pine Tar 150
Aluminum Sulphate 150
Methyl Isobutyl Ketone............. 150
Allyl Chloride and Alcohol......... 153
Chlorinated Refrigerants 153
Aromatic Solvents 153
Acetic Acid 153
Reagent Chemicals 153
Neoprene Rubber 154
Linseed Oil 154
Pyrethrum 154
Phosphoric Acid 154
Tannic Acid 154
Apple Syrup 154

This installment covers orders, rules and regulations issued by the War Production Board and the Office of Price Administration during August, 1943. Copies of each item interpreted may be obtained by writing to the appropriate federal agency.

STEEL PIPE

Limitation Order L-211 was expanded by WPB on Aug. 30 to include specifications schedules for steel pressure pipe, tubes and other types of steel pipe. Schedules previously issued cover such steel products as reinforcement steel, structural shapes, barbed wire, fence posts and tubular goods. The Order restricts manufacture, but does not control uses of steel products.

Of the three schedules added, Schedule 11 provides specifications and standard sizes for steel pressure pipe commonly used in power plants and some industrial plants. Specifications include both carbon and alloy steel piping in lap welded, seamless, electric resistance welded and fusion welded grades. Schedule 12, covering pressure tubes, includes boiler, cracking still, heat exchanger, condenser and superheater tubes used in the oil, synthetic rubber, chemical and other industries. Schedule 13 covers all other types of pipe such as corrugated pipe, dredge pipe, etc., and requires a reduction of about 65 percent in the number of sizes and wall thicknesses shown in various pipe mill catalogues.

HEAT EXCHANGERS

Order L-172 was amended by WPB on August 13, and provides that a purchase order for any heat exchanger not within the definition of a "critical heat exchanger", but which was authorized before July 9, 1943, shall be considered as an order for a critical heat exchanger, and shall be reported as a part of such schedule, unless otherwise directed by the WPB. The amended Order also makes it clear that a tube bundle or shell or pressure vessel, designed for replacement in a critical heat exchanger in Group 1 or Group 2 as defined in the Order, is included in its respective group.

EMPLOYEE SAFETY EQUIPMENT

Direction 11, CMP Regulation No. 5, was issued by WPB on August 13, to permit employees to use their employers MRO preference rating to purchase safety equipment. Employees of persons operating businesses listed in Schedules 1 and 2 of CMP Regulation No. 5, are eligible to use the procedure. The employee must obtain from his employer a certificate indicating the type and size of safety equipment required, that it is required in the employer's business, that the employer requires the employee to furnish the equipment, and that the employee does not possess any satisfactory substitutes. Both the employer and the employee must sign this certificate.

FIBRE DRUMS

Conservation Order M-313 was amended by WPB on August 2, revising the restrictions on the shipping, use and reporting requirements for fibre drum containers. Notwithstanding any preference rating already received, no manufacturer shall ship, or pack any products in, fibre drums, except as specifically authorized on Form WPB-2700, or Form GA-255. On or before the third day of October and each second month thereafter, every manufacturer must forward a report on Form WPB-2700 (PD-881).

USED STEEL SHIPPING DRUMS

Limitation Order L-197 was amended on August 14 by WPB providing that used steel shipping drums which are suitable for reuse for packing either edible products or naval stores products, may not be used for any other purpose but are restricted to the uses of those industries. Used drums may now be employed for packing turpentine, but new steel drums are still prohibited for this purpose.

ANTI-FREEZE MATERIALS

MPR-170, Amendment No. 6, was issued on August 16, by OPA, eliminating the requirement that producers mark the strength of their anti-freeze in terms of "Standard" or "Sub-Standard." However, packages must indicate the number of gallons of anti-free which must be added to one gallon of water to reduce the freezing point of a mixture 10 deg. below zero Fahrenheit, or as an alternative, designate by an anti-freeze protection table the amount of anti-freeze needed to obtain the same results.

Limitation order L-51 as amended August 11, 1943 by WPB, releases "permanent type" (ethylene glycol type) anti-freezes for use in several Western States where driving conditions are such as to cause alcohol mixtures to boil off rapidly. The Order also adds diacetone alcohol to the list of materials under Limitation Order L-51.

RAW OR ACIDULATED SOAP STOCKS

Maximum Price Regulation No. 53 was amended by OPA on August 18 to restore a more nearly normal flow of soap stocks through usual trade channels. The amended regulation set dollars and cents delivered prices for New York, Chicago and Cincinnati and Los Angeles and San Francisco, in which the overwhelming majority of all soap stocks normally is sold, and provides that soap stocks delivered in other communities shall take the maximum price for the nearest of the five specified cities, plus or minus the normal differential which prevailed prior to price control between the buyer's cities and the nearest of the specified five. The average ceiling price for these soap stocks will not be changed by this action.

HIDES, KIPS AND CALFSKINS

Revised Price Schedule No. 9 was amended by OPA on August 20, providing for various changes in the Schedule and adding a licensing requirement. Most of the changes are in wording to make previous requirements more explicit. Others are made to improve compliance with and enforcement of price control for these raw materials for leather. Ceiling prices are not changed. The licensing requirement states that persons operating under this Schedule are automatically licensed. Violation of any part of this Schedule may provide cause for suspension of the license.

ETHYL ALCOHOL

General Preference Order M-30 was amended on August 19 to read Allocation Order M-30. The original Order which was issued on Jan. 18, 1942, cut the use of alcohol for certain purposes by fixed percentages, while allowing full requirements for what were then considered the most essential purposes. Now, the distribution of alcohol will be controlled by allocation, with the exception of deliveries to persons using less than 3,500 gal. in any three-month

period. For these small users, restrictions remain approximately the same as were provided for under the original Order. The amended Order retains the provision that any person using alcohol for a use not listed may receive 100 percent of prior use. Special provision is made for the delivery of ethyl alcohol and rubbing alcohol to hospitals and scientific institutions, licensed physicians, dentists and veterinarians, holders of prescriptions, wholesale and retail druggists, and manufacturers of rubbing alcohol compounds. Provision is also made for delivery of alcohol to manufacturers of anti-freeze preparations.

COAL TAR PRODUCTS

MPR-447, issued August 14 by OPA, established dollars-and-cents ceiling prices which producers may charge in their sales of coal tar. The new ceilings, based on March, 1942 prices at individual plants, are approximately the same as the producer's current plant prices. The average price, as determined by the OPA's analysis is 5.58 cents per gallon.

CALCIUM

General Preference Order M-303 was suspended by WPB on August 18. A shortage of calcium which appeared to be developing earlier this year has been averted by increased manufacturing in this country.

PINE TAR AND PINE TAR OIL

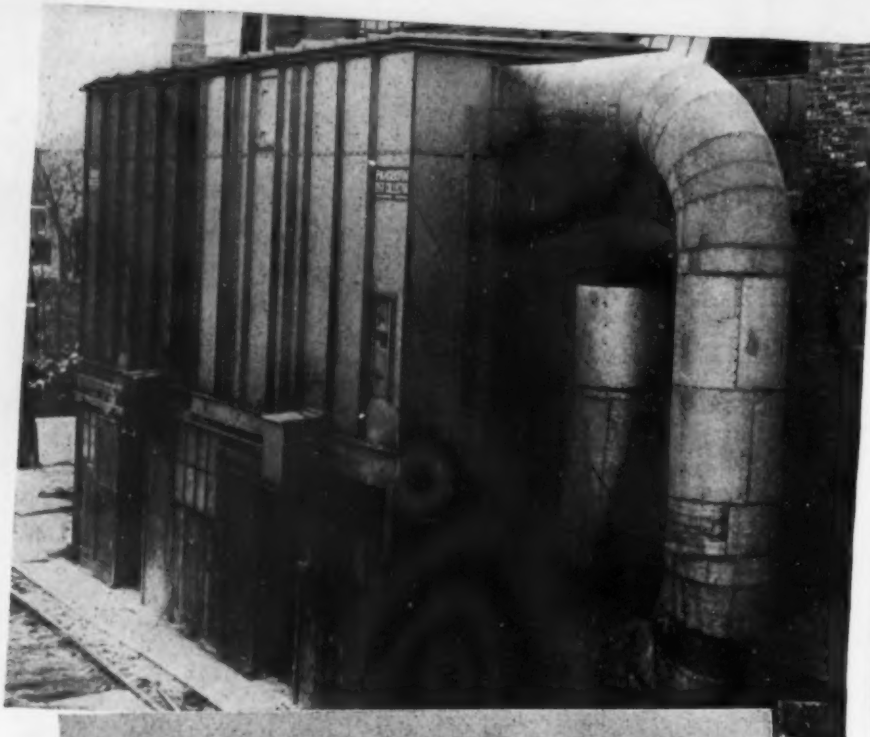
MPR-446 was issued by OPA on August 13, establishing specific uniform ceiling prices on producer's sales of pine tar and pine tar oil for the entire industry. Dealers' costs will generally not be affected by this action, and sales by dealers will remain under the provisions of the General Maximum Price Relation.

ALUMINUM SULPHATE

Amendment No. 18 to Revised Supplementary Regulation No. 14 of the GMPR, issued by OPA on August 17, authorizes manufacturers of war-grade iron-free aluminum sulphate to increase their maximum prices by not more than 50 cents per hundred pounds to cover increased cost of production. Processing operations using a low grade nonrestricted bauxite are more complicated and costly than when using alumina hydrate, no longer available for this purpose. The small increased cost to industrial purchases of this chemical should not cause sufficient pressure to change their prices on the consumer items they manufacture.

METHYL ISOBUTYL KETONE

General Preference Order M-322 was amended on August 10 by WPB outlining more detailed information which must be provided by each person placing a purchase order for methyl isobutyl ketone with his supplier. The certification of use must now cover both primary and end use. More detailed information is also required concerning Army, Navy, and Lend-Lease Contract Numbers and



DUST CONTROL

MEANS ECONOMY ON THE PRODUCTION FRONT

• Dust Control, effecting worthwhile savings in time, labor and materials, has been accepted as a great economy factor on the production schedules of modern industrial plants. The thirty-five years' experience and progress which give to Pangborn the leadership in the field of Modern Dust Control are successfully applied day after day—in almost as many different ways as there are industries.

• At a plant located in the heart of one of our great industrial cities—specializing in work which creates a vast amount of dust—effective Dust Control had long been desired but, in spite of extensive installations for the purpose, the problem could not be solved. Corrective results were recently achieved with a small Pangborn cloth screen Dust Collector which was installed in conjunction with the customer's entire collection system.

• Because of the outstanding success of this initial installation, the company decided to purchase the larger unit which is pictured above. After a short period, they equipped their eastern plant with similar collectors and have now ordered *four more* units for their main plant.

• This standardization on Pangborn equipment, based on actual operation experience, is proven evidence of the value that progressive management places upon the economy of effective Dust Control as obtained through Pangborn equipment and engineering service.

Send today for your copy of our new bulletin #909 which will help you to visualize the savings you can effect through Modern Dust Control.

ARMY E NAVY

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WORLD'S LARGEST MANUFACTURER OF DUST COLLECTING AND BLAST CLEANING EQUIPMENT

PANGBORN CORPORATION · HAGERSTOWN, MD.

SCRUBBING GASES ?

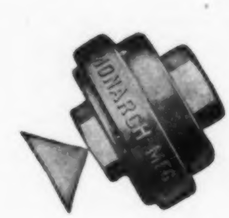


Fig. 645

Are your scrubbing nozzles as efficient as you think they *could* be? Do they resist the corrosion or wear conditions satisfactorily? Produce the breakup and distribution you would like?

Right now thousands of Monarch Fig. 645 nozzles are scrubbing all kinds of gases all over the world. . . . Perhaps they can do a *better* job *for you!*

Outline your spray problem for us—If your liquid can be sprayed with direct pressure at all—Monarch can furnish the nozzles.

NOZZLES FOR:

- OIL ATOMIZING
- HUMIDIFYING
- AIR WASHING
- DESUPERHEATING
- SPRAY PONDS
- MILK POWDERING
- ACID CHAMBERS
- CONCRETE CURING

WRITE—While you think of it.

MONARCH MFG. WKS, INC.
2730 E. WESTMORELAND ST.
PHILADELPHIA 34, PA.

Export License Numbers. The purpose of this revision is to effect a better allocation of lacquers and thinners.

ALLYL CHLORIDE AND ALCOHOL

Allocation Order M-342 was issued by WPB on August 10, placing under allocation both Allyl Alcohol and Allyl Chloride. The usual chemicals allocation Forms WPB-2945 and 2946 must be used. Deliveries and use of less than 50 lb. of either one of these chemicals during any calendar month may be made without specific WPB authorization.

CHLORINATED REFRIGERANTS

Conservation Order M-28 was amended on August 7 by WPB requiring consideration by the General Industrial Equipment Division of all applications for allocating of chlorinated hydrocarbon refrigerants on an individual basis. Requirements for refrigerants used in all food processing, storage and dispensing units are excepted under the terms of the amendment. Other changes have been made providing for more detailed information on requests for allocation, and broadening requirements for filing of inventory statement to include all users as well as suppliers.

AROMATIC PETROLEUM SOLVENTS

Allocation Order M-150 was amended by WPB on August 4, to reduce from 17 to 11 the number of primary products which must be specified on applications for allocation. The new list is as follows:

Paint, varnish, lacquer
Flame-proof composition
Natural and synthetic rubber solution
Mineral solvents
Dyestuffs
Intermediates
Other organic chemical
Other (specify)
Resale (in original form)
Export (in original form)
Inventory (in original form)

ACETIC ACID

Allocation Order M-243 was amended by WPB on August 7 to cover purchases of acetic acid and acetaldehyde. Effective September 1, the Order calls for the use of allocation Form WPB-2947 for all deliveries by suppliers, and WPB-2945 by prospective purchasers of any of the chemicals if their requirements in any month exceed 27,000 lb. For purchases in any one month of amounts less than 27,000 lb., but greater than 10 gal., the purchaser must certify the end use of the chemical to his supplier. Acetic acid of less than 12 percent concentration (vinegar) produced at plants at which there are no facilities for further chemical conversion, is exempt.

REAGENT CHEMICALS

Supplementary Order P-135-a was issued by WPB on August 4, providing a standard form of certification as to the uses of reagent chemicals ordered by research and other laboratories. The new certification states "that the reagent chemicals called for by this order will

be used, or resold for use, in a laboratory for one or more of the following purposes: analysis, testing, control, educational or research." The Order also provides that each laboratory shall be entitled to the full small order exemption.

NEOPRENE RUBBER

MPR-220, Amendment 12, was issued by OPA on August 5 to lower the ceiling prices for rubber fabric, apparel, and other commodities for which neoprene synthetic rubber is used. These reductions further reflect the lowering in price of neoprene from 45 cents to 27½ cents per pound.

LINSEED OIL PRICES

MPR-53 was amended by OPA on Aug. 30 to permit sellers of linseed oil, other than crushers, to mark up their prices to compensate for the cost of distribution. The regulation previously set the same ceiling for crushers and resellers, and this amendment simply restores the reseller's normal price differential. Even with the markups, the cost of linseed oil will still be under the going price at the time price control was first imposed.

PYRETHRUM

Allocation Order M-179 was amended by WPB on Aug. 30 to provide for the use of the standard chemicals allocation Forms WPB-2945 and 2947 by suppliers and consumers of pyrethrum. The time limit has expired on Form PD-951, previously used.

BYPRODUCT PHOSPHORIC ACID

Allocation Order M-340, Miscellaneous Chemicals, was amended by WPB on August 28 to extend control to byproduct phosphoric acid. Consumers must certify end uses to suppliers, who in turn must report to the WPB on the standard Form WPB-2947. A maximum of five tons may be delivered to any one person in any month without specific authorization and without certification. Substantial quantities of byproduct phosphoric acid are now obtained from the processes used in the manufacture of methyl methacrylate, a transparent plastic material.

TANNIC ACID

Conservation Order M-204, originally issued by WPB on Aug. 8, 1942, restricting the use of nutgalls and tannic acid U.S.P., was revoked on August 24. The Chemical Division considered that there no longer is a critical shortage in this field. Medical recommendation against the use of tannic acid in the treatment of burns plus increased importation have combined to relieve the former shortage.

APPLE SYRUP

MPR-233 was amended again by OPA on August 24, replacing the ceiling of 16 cents per pound on sales of bland apple syrup.

NEW PRODUCTS AND MATERIALS

PAPER MILL SLIME CONTROLLER

For some time the medical profession has used for treating skin diseases and mucous membranes phenyl mercuric borate, phenyl mercuric nitrate, and phenyl mercuric picrate. Recently, a blend of these salts with other ingredients has been marketed to the paper industry in small paper envelopes which can be added to the beater directly without opening the envelope to control slime. These envelopes are sold under the trade-mark Merfenelopes by the Hamilton Laboratories, Hamilton, Ohio. One ounce of these salts to a basis of ten tons of paper has been found adequate in many mills. Some mills are said to be obtaining excellent results with one ounce to 20 tons of paper. The dosage depends upon several factors, two of which are the amount of infection present in the system, and the water conditions.

AID IN POLISHING LENSES

For the purpose of eliminating scratches which occur during the fine grinding operation in the processing of lenses and prisms, Col-Emeroid was developed by Optical Engineering Laboratories, New York, N. Y. When used in the fine grinding process it acts as a flocculent keeping the emery finely suspended and preventing the emery from coagulating into larger sized particles. In this way it eliminates the tendency for scratching during the fine grinding process. Moreover it enables the emery to be broken down more finely, thus leaving a smoother finish on the surface of the glass. This in turn decreases the time necessary for polishing out the surface. It also acts in a manner to eliminate the caking of the emery when left standing for any length of time. Col-Emeroid can be used directly with the emery instead of water, or it may be diluted with water, using one part of Col-Emeroid to four or five of water.

SUPERGAS

The United States has a new airplane fuel which raised engine power half again over that of the engines burning 100-octane gasoline, according to a statement made by Dr. Gustave Egloff to the National Association of Manufacturers' at San Francisco a few days ago. He asserted that the fuel would give allied planes a superiority in speed, climbing power and lifting power, which would put enemy planes as much at their mercy, as if they were "roosting pigeons." The supergas called triptane was developed by Universal Oil Products Co., Chicago, and the pilot plants producing the gas have been in continuous operation for more than a week. The announcement stated that triptane is the most powerful hydrocarbon known for use in internal combustion engines. Its anti-knock properties are of such magnitude that no commercial engine has been built which is capable of utilizing the full power value of pure triptane. When used as a component of aviation gasoline, it greatly enhances the performance of present day aircraft engines and makes possible the design of future engines of even greater power and efficiency. The new process makes it possible to produce triptane on a commercial scale at an estimated selling price of less than $1 a gallon.

CONTENTS

Paper Mill Slime Control	157
Aid in Polishing Lenses	157
Supergas	157
Pecan Shell Oil	157
Colored Smokes	157
Blotting Paper Luggage	157
Adhesive for Metals	157
Disinfectant	157
Insect Repellant	160
Rust Preventive	160
Soap Extender	160
Thermoplastic Coatings	160
Dust Controller	161
Corrosion Preventive	161
Packaging Material	161
Floor Cleaner	162
Linseed Replacement Oil	162
Adhesive For Plywood	162
Moisture-Proof Packaging Material	163
Jar Sealing Rings	163

PECAN SHELL OIL

Pecan oil is now available in large quantities from the Planters Cotton Oil Co. of Weatherford, Texas. This oil is said to be the equal of olive oil for salads and table use. Among its other uses are in dyes and making high-grade soaps. It is pressed from the waste material of pecan shelling plants which, in the past, has been sold at an extremely low price, principally as a chicken food.

COLORED SMOKES

Rainbow-colored smokes which put out from tiny cannisters in red, orange, yellow, green and violet hues, now enable American tanks and other ground vehicles in the battle zones to operate with greater freedom in areas of intense air activity without danger from attack by their own planes, according to the announcement of E. I. du Pont de Nemours & Co., Wilmington, Del. Various colors can be used to identify command posts to friendly aircraft. Also, one airplane may signal another by use of a distinctive color. Cannisters equipped with a small parachute carrying an identifying color may be dropped from observation planes to point out enemy targets for artillery attack. The use of colored smokes has been extended to the development of special cannisters that can be used on water as well as on land. Also when colors cannot be seen, as at night, another kind of cannister is used which produces a brilliant white light, like the colored smoke used in daylight, the light from this type of cannister can be seen at night from the altitude of 10,000 ft. With white light, the code between tanks and airplanes may involve the number of cannisters liberated, the intervals between release, or some special pattern laid out on the ground.

BLOTTING PAPER LUGGAGE

It has been reported that the Hycar Chemical Co., Akron, Ohio, has developed a new type of luggage. This new product is made from blotting paper immersed in the company's new synthetic rubber, Hycar. After immersion the paper is dried in a warm oven. It is said to be waterproof, resistant to oils, grease and solvents; unaffected by extremes of temperature. The luggage is lighter than leather or coated fabrics, and strong and durable.

ADHESIVE FOR METALS

The Redux process, provides, through the use of synthetic resin adhesives, a method of bonding light alloys and steel with a strength exceeding that of riveting, and of giving strong joints between metal and wood. The adhesives used in the process are unaffected by water, oil, or solvents. It works best with trivalent metals such as aluminum, chromium and iron or steel and gives less satisfactory joints with brass, tin or zinc. The resin bond is mildly thermoplastic and loses strength at temperatures above 100 deg. C The process was developed by Aero Research, Ltd., England.

This wide extension in the field of resin bonding opens up new possibilities in aircraft construction and its development may prove to be as significant as the effects of the introduction of the resin adhesives to the plywood industry.

DISINFECTANT

For the purpose of curbing germ growth with high effectiveness under a wide variety of conditions the new disinfectant "Perm-Astic-Ramplex" has been developed by Rampel Chemical Co., New York, N. Y. This material has no odor, taste or color and is said to be nontoxic in the concentrations in which

(*Continued on page* 160)


"QUALITY IDENTICAL–"
DISTILLED WATER
DEMINERALIZED WATER
RAW INFLUENT
ACID REGENERATING SOLUTION (H_2SO_4)
ZEO-KARB H UNIT
DE-ACIDITE UNIT
ALKALI REGENERATING SOLUTION (Na_2CO_3)
DEGASIFIER
CO_2
TO SERVICE
DE-MINERALIZED WATER
PERMUTIT DEMINERALIZING PROCESS
Step 1. Zeo-Karb* H, an acid-regenerated cation exchanger, replaces metallic cations with hydrogen ion, converting salts present into the corresponding acids.
Step 2. De-Acidite* removes from solution the acids formed in Step 1. Bicarbonates, converted to CO_2, may be removed by degasification.

but the cost of Demineralizing runs as low as 5% of the cost of distillation!

Here is an opportunity many have been waiting for—the synthetic equivalent of distilled water at a cost almost anyone can afford. Permutit Demineralizing is a low-cost ion exchange process that produces a water equal in quality to most distilled supplies and superior to many.

The new process makes big savings for users of distilled water. It puts distilled-quality water within reach of others who could not afford distillation. It's being applied in many interesting processes outside the field of water conditioning.

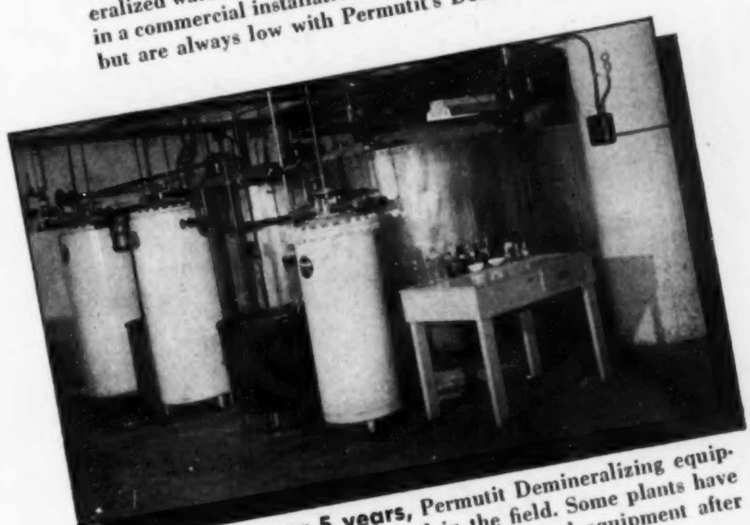
The efficiency of Permutit Demineralizers is assured by Permutit's comprehensive service: the manufacture of the equipment as well as the ion exchange materials, servicing by a national staff of field engineers backed by Permutit's 30 years of experience in water conditioning.

Write for a free bulletin to The Permutit Company, Dept. K, 330 West 42nd Street, New York 18, N. Y. In Canada: Permutit Company of Canada, Ltd., Montreal.

*Trademarks Reg. U. S. Pat. Off.

WATER	RAW	DEMINERALIZED
Calcium and Magnesium	43	0
Sodium	21	3
Total cations	64	3
Bicarbonate	34	3
Chloride	6	0
Sulfate	24	0
Total anions	64	3

3 cents per 1000 gallons was the cost of producing Demineralized water of this quality (expressed above in ppm as $CaCO_3$) in a commercial installation. Costs vary with quality of raw water, but are always low with Permutit's Demineralizing process.



In operation over 5 years, Permutit Demineralizing equipment has been thoroughly tested in the field. Some plants have tried one installation, then ordered additional equipment after they had proved its practical value for themselves.

PERMUTIT

WATER CONDITIONING
MATERIALS AND EQUIPMENT

ION EXCHANGERS
CHEMICALS

(*Continued from page* 157)

it is made available for use in various applications. It is soluble in water, as well as in a number of organic solvents.

INSECT REPELLANT

THE NEW insect repellant developed by Skol Co. and known as Skat is being supplied to the armed forces of this country. The J. B. Williams Co., Glastonbury, Conn., is supplying civilian requirements. The lotion for face, hands and other exposed surfaces contains Indalone, an undisclosed chemical that is distasteful to mosquitoes, most flies, chiggers, and other pests. Its effectiveness is said to range from one to four hours, depending upon conditions.

RUST PREVENTIVE

AS THE fittings and machinery of the Lafayette (former French liner Normandie) were quickly coated with a new petroleum rust-preventive as soon as the lowering of the water inside the hull exposed them to the air, only one of the ocean giant's turbines has been damaged substantially by its long rest in the mud, according to a statement made recently by R. Nelson Rose, lubricating engineer of the Colonial Beacon Oil Co., subsidiary of the Standard Oil Co. (N. J.), the developers of the process. The new petroleum specialty is a series of several rust-preventing products and has the property of penetrating water in contact with metal surfaces and spreading out on the surface so as to seal the metal from oxygen, Mr. Rose said. As a result of its adoption, equipment removed from the vessel as she was stripped to lighten her was washed in one of the rust preventives before being stored for later use. In addition to main turbines, motors and gyroscopic control devices, the equipment treated with the petroleum specialty includes hundreds of tons of pumps, lamps and lighting fixtures, kitchen utensils, laundry equipment, and ice machines. A great quantity of critical material that would be hard to replace has thus been saved from destruction by corrosion.

SOAP EXTENDER

IT IS claimed by Burkart-Schier Chemical Co., Chattanooga, Tenn., that the new product Burk-Schier PWT may be substituted pound for pound in the textile plant for a considerable percentage of the soap formerly used.

THERMOPLASTIC COATINGS

A DEVELOPMENT in thermoplastic coatings just announced is the compound, Amercoat No. 33, for application on metal, concrete or wood. This product is a liquid plastic which is cold-applied by convention spray or brush method. It may be applied in any number of coats required for any particular condition or use. This material is a combination of several inert synthetic resins. It has shown good results in such applications as lining for storage tanks and other equipment to protect foods from contamination by corrosion caused by dilute acids or caustics; for superstructures, deck machinery, ventilators and

other marine equipment; for protecting machinery and equipment in chemical plants, bottling plants, breweries and dairies from corrosion. The Amercoats are products of the American Pipe & Construction Co., Los Angeles.

DUST CONTROLLER

AIRPORT dust promises to be laid effectively by a new emulsified oil developed by the Curran Corp., Malden, Mass. It is said to wet and penetrate all types of soil, including moist earth, to a depth of 2 in., at which point it somehow becomes insoluble and does not leak away during heavy rains. It is said also to include an effective weed killer in its composition.

CORROSION PREVENTIVE

ZINC and cadmium surfaces may be given a lasting protection from the ravages of corrosion through the application of a new coating, Iridite, which has been developed by Rheem Research Products, Baltimore, Md., a subsidiary of Rheem Manufacturing Co. It is a chemical coating applied to zinc and cadmium surfaces. Simple to use and low in cost, Iridite is literally soaked up by the plated metal, becoming an integral part of it. It will not flake off or chip, it is said. This material provides an olive drab color very similar to that used by the armed forces. The protective skin provided by the new material is extremely thin, so thin it does not pile up to alter the dimensions of the parts to which it is applied to any extent that can be detected by ordinary measuring devices. Under ordinary conditions 100 gal. of Iridite solution will coat 20,000 sq.ft. of work. The plated parts are treated with the Iridite by dipping them into a solution for from 10 to 60 sec., and then immediately rinsing in hot water. As soon as a part is dried it can be handled for shipment.

PACKAGING MATERIAL

IN ANNOUNCING a new adhesive developed by E. I. du Pont de Nemours & Co., Wilmington, Del., which makes improved weatherproof boxes possible, Dr. J. S. Fonda, Grasselli Chemicals Dept., said that fiberboard containers are now meeting government specifications well beyond the imagination of the industry less than two years ago. The new packaging material is made of four to eight sheets of heavily sized paper laminated or glued together with a water soluble vinyl resin. Containers are fashioned on standard fiberboard box machinery which may be operated at full speed without any special equipment, adjustments or added labor. Boxes appear to be identical to the common, everyday variety, most of which disintegrate rapidly when wet. Where moisture condensation is a problem, in removal from cold storage, for example, this material is said to be the answer. It represents no repulping difficulties, nor is there anything in the package that will corrode metallic contents. It will meet the drastic test of anchoring in the surf for 24 hr. In order to meet specifica-

tions, it must then be impossible to separate the plies or layers of paper more than one-quarter of an inch along the edges.

FLOOR CLEANER

Marketed under the name Absorbo is a new oil and grease absorbent for cleaning floors. It has been developed by the Fidelity Chemical Products Corp., Newark, N. J. The product is listed by Underwriters' Laboratories, Inc., as a Class 1 non-combustible absorbent for reducing fire and slipping hazards and for cleaning floors. Though granular in form, Absorbo is non-abrasive and will not damage machinery or working parts due to abrasive action. It is also odorless, non-poisonous and non-injurious to skin, clothing or flooring, according to the manufacturer. It may readily be spread by hand and used on any type of floor surface. It absorbs up to 45 to 50 percent of oil or grease by weight.

LINSEED REPLACEMENT OIL

To meet the new government regulation, the National Lead Co., New York, N. Y., has developed and is now marketing a new product, Dutch Boy linseed replacement oil, for thinning paste white lead or paste red lead or for making paint from dry red lead. This material not only complies with the WPB requirements regarding the non-volatile content of oil to be used for mixing paints on the job but it also conforms to the more specific requirements of Federal Specification TT-0-371 covering linseed replacement oil for thinning paints or oil pastes. This specification is designed to insure procurement of a replacement oil made from the highest quality ingredients which will closely resemble straight raw linseed oil. Dutch Boy linseed replacement oil contains only pure linseed oil, mineral spirits and drier. Its non-volatile portion is a careful blend of raw oil and heat-bodied (polymerized) oil. Weighing 7.4 lb. per gal., it has the consistency and working properties of straight linseed oil and can be used in place of the latter in any white lead or red lead paint for any coat on any surface. The paint it produces has the same general properties in respect to body, brushability, drying qualities, spreading rate, etc., as paints formerly made with raw or boiled linseed oil.

ADHESIVE FOR PLYWOOD

From Wilmington, Del., comes an announcement of E. I. du Pont de Nemours & Co., of a radically new type of adhesive developed by that company for use in bonding thin sheets of wood that are molded to form the bodies of military helicopters. The most important of several unusual qualities of this new plywood glue is that it is both thermoplastic and thermosetting. This means that when ply-covered forms are heated under pressure in ovens, the adhesive at first becomes fluid and permits the layers of thin wooden strips to move into intimate contact. After only 20 min. the adhesive sets as a permanently

tough, heat-resistant, insoluble material. Plywood bonded with Adhesive No. 4624 is unaffected by the high temperatures that build up in the interior of airplane surfaces under a tropical sun. In fact, plywood of this type will withstand being boiled in water for three hours. It retains its flexibility at low temperatures when most adhesives become brittle. Moreover, its weight as a plywood bonding agent is almost one-fourth less than other suitable materials.

MOISTURE-PROOF PACKAGING MATERIAL

WHEN American doughboys plunged ashore on Sicily's rocky coast a short time ago, they took with them packaged fire power—machine guns wrapped in Saran film, the Dow Chemical Co.'s Midland, Mich., new moisture-proof packaging material. Saran packaged guns consigned to beachheads with neither lighters nor dockage facilities have been simply tossed overboard, to be brought ashore when time permitted. Even in such cases, there was no evidence of moisture penetration. While its most distinctive property is moisture resistance (it is said to be three times greater than that of any other comparable material) Saran film is tough, durable, highly resistant to chemicals, and flexible at low temperatures. In normal temperatures it is soft to the touch and very pliable. At present the film is produced in one grade only, which is suitable for the packaging of metal parts and assemblies. Odorless and tasteless types are being developed, and will be ready for food and tobacco packaging after the war. Its incombustibility eliminates any fire hazard. It is not affected by oils, greases or acids.

JAR SEALING RINGS

RUBBER technicians have developed jar sealing rings of non-critical materials that are enabling commercial food packers to conserve large quantities of foodstuffs that might otherwise be wasted, the research division of the B. F. Goodrich Co., Akron, Ohio, has announced. In answer to an appeal for sealing rings to replace rubber ones now denied by government restrictions for all but essential uses, Goodrich has succeeded in producing two different types of rings which have proved satisfactory and which are already in mass production. One type of ring used for low heat packs is made of Koroseal, the other is a vulcanizable linseed oil compound combined with various secret ingredients. Both types have been subjected to rigid tests by governmental food and health officials and have won their approval as practicable means of accomplishing an emergency wartime job. In appearance the rings are almost identical with the standard rubber ones. The tensile strength and elasticity of the vulcanized linseed oil ring are not as high as those of rubber, but for food packing, it was pointed out, it is necessary that the rings have only fair tensile strength, good compressibility, low porosity and resistance to heat.

PERSONALITIES

Greystone-Stoller

P. B. Stull

Sidney C. Moody

✦PHILIP B. STULL, general manager of the Paper Makers Chemical Department, has been elected vice president of Hercules Powder Co., and RALPH B. MCKINNEY has been appointed to succeed Mr. Stull as general manager. Mr. Stull became associated with Hercules in 1926, serving first as manager of the Virginia Cellulose Department, until 1933 when he was elected a director. Four years later he was transferred to the Paper Makers Department as its head.

✦FREDERICK G. SAWYER, who held Bleode scholarship of the Chemists Club for 1942–43, has completed his doctorate thesis in chemistry at Brooklyn Polytechnic and begins work October 1 with American Cyanamid Co.

✦MARSTON TAYLOR BOGERT, CHARLES RAYMOND DOWNS, PER KAY FROLICH and ROBERT JEROME MOORE have been initiated into membership in the professional chemical fraternity, Alpha Chi Sigma. The ceremonies were conducted in Sterling Chemistry Laboratory at New Haven, Conn., on September 18 under the joint auspices of the Chi Collegiate Chapter and the New York Professional Chapter.

✦JAMES E. KEARNEY has been appointed by G. E. Seavoy, vice president of Swenson Evaporator Co., to the position of chief engineer of the Swenson Evaporator Co. Mr. Kearney is a graduate of the University of Missouri, has a background of varied experience in the design, construction and operation of chemical plants and heavy chemical plant equipment. Until recently he was employed by H. K. Ferguson Co.

✦FRED E. HARRELL, assistant chief engineer of the Reliance Electric & Engineering Co. since 1934, has been appointed chief engineer of the company, reporting to A. M. MacCutcheon, engineering vice president.

✦SIDNEY C. MOODY has been announced as assistant general manager in the Calco Chemical Division of the American Cyanamid Co. For many years Mr. Moody has been a department sales manager.

✦J. C. KALBACH became associated with the staff of the Institute of Gas Technology of Chicago on September 1. Mr. Kalbach is a chemical engineering graduate of Columbia University.

✦VINCENT F. WATERS, technical assistant of the Technical Association of the Pulp & Paper Industry, has been appointed editor of the *Southern Pulp and Paper Journal*. He will make his headquarters in Atlanta.

✦T. H. WICKENDEN has been appointed manager of the Development and Research Division of International Nickel Co., New York, N. Y. H. J. French will serve as assistant manager of the Division.

✦JOHN H. LONG will be in charge of the new Sales Research Division of Hercules Powder Co., Wilmington, Del. Dr. Long has been with Hercules for ten years, specializing on various technical problems involved in marketing.

✦C. L. HUSTON, JR., assistant to the president and member of the Board of Directors of Lukens Steel Co., has been named president of Lukenweld, Inc. Mr. Huston succeeds Everett Chapman who resigned to establish his own business as a consulting engineer.

✦HARRY F. KOLB has succeeded Milton M. Bixby as manager of Industrial Chemical Division of Paper Makers Chemical Dept., Hercules Powder Co. Mr. Bixby has been assigned to special duties in the Paper Chemicals Division. George F. Foulke, Jr. has been transferred to the High Explosives Operating Dept., Hercules Powder Co., Wilmington, Del. Harry V. Chase, former manager of Badger Ordnance Works, succeeds Mr. Foulke as manager of Sunflower Ordnance Works, operated by Hercules Powder Co. Mr. Chase has been replaced by Charles H. Gant, former manager of New River Ordnance Plant.

✦FLOYD H. WALKER, formerly chief engineer of Swenson Division of the Whiting Corp., has been appointed chief engineer of Pennsylvania Salt Manufacturing Co., and will be in charge of the Central Engineering Division. He will have charge of the new construction and assist the manufacturing and other departments in engineering matters.

✦A. E. GAYDOS, formerly in charge of the Central Engineering Division of Pennsylvania Salt under Mr. Penfield, has been named assistant to the vice-president in charge of manufacturing, and assigned to special duties.

✦G. F. HAND is now with the Fairchild Engine and Airplane Corp. as chemical engineer in plastics research.

✦JOHN EASTON has been appointed director of the development and standardization activities of the Whiting Corp., Harvey, Ill. He succeeds A. J. Brown who has been transferred to California to be manager of the Pacific Coast Branch.

✦CECIL DAVEY has been elected vice-president and general manager of Everlasting Valve Co., Jersey City, N. J. Mr. Davey started with the company 32 years ago. In 1916 he was made plant superintendent.

✦HOMER S. BURNS of Freeport Sulphur Co., is retiring after 30 years in the sulphur industry he helped develop from an infant. His resignation as assistant vice president and power superintendent took effect September 1.

✦CHARLES S. VENABLE, formerly in charge of the viscose chemical research laboratory of American Viscose Corp., Marcus Hook, Pa., has been appointed director of chemical research. The company is consolidating all of its basic research activities at Marcus Hook. Heretofore, the company's research work on viscose and acetate rayon had been carried on at Marcus Hook and Meadville, Pa., respectively. F. William Koster, formerly in charge of acetate rayon and vinyon research at Meadville, becomes assistant director of chemical research.

✦ARTHUR A. WUEST has joined the staff at the Columbia Park chemical plant of International Minerals & Chemical Co. as chief chemist in charge of proc-

ess control. He is a graduate of the University of Ohio and is a chemical engineer recently engaged in metallurgical research.

✦ Roy H. Walters has been appointed director of engineering research for General Foods Central Laboratories, according to T. M. Rector, manager of research and development for the company. Mr. Walters has worked on chemical projects since he joined General Foods in 1934. He studied chemical engineering at the University of Wisconsin.

W. S. KIRKPATRICK

✦ W. S. Kirkpatrick has been named assistant to the general manager of Consolidated Mining & Smelting Co. He returns to Trail, B. C., from Calgary, Alta., where he had been manager of the Alberta Nitrogen Products Co., a subsidiary organization.

✦ Arnold Belchetz, associated with the Shell Oil group and M. W. Kellogg Co. for the past 15 yr., has been appointed as director of research and development for Stauffer Chemical Co.

✦ Clarence C. Helmle has joined the technical staff of the Enthone Co., New Haven, Conn. Mr. Helmle is a chemical engineer, a graduate of Rensselaer Polytechnic Institute, Class of 1932. After graduating he joined General Electric Co.'s Bridgeport Works where he was successfully plating analyst, chemist, and finally head of the inorganic laboratory in charge of electroplating, metallurgy and general chemistry. He will be engaged in plating, equipment design, process development and technical service.

✦ William H. Gabeler has been appointed vice-president of the Summers Fertilizer Co., Baltimore, Md. He will be located at the main office of the company at Baltimore where he will be in charge of the company's development of its chemical and food processing plans. Mr. Gabeler, prior to joining the Summer's organization, was assistant vice-president of the Davison Chemical Co.,

with whom he was associated for more than 23 yr.

Clayton S. Shoemaker

♦Clayton S. Shoemaker has been appointed as eastern sales manager for Dow Chemical Co. Frederick A. Koch will be the assistant eastern sales manager. Ralph E. Dorland, not being desirous of taking over the heavy responsibility of opening additional offices, requested that an eastern sales manager be appointed, although willing to continue as manager of the New York Office. Both Mr. Shoemaker and Mr. Koch will make their headquarters in New York.

Ray B. Crepps

♦Ray B. Crepps, director of Purdue University's materials testing laboratory, joined Owens-Corning Fiberglas Corp., September 1, as director of the testing division of the company's research laboratories, at Newark, Ohio. He will be in charge of a new testing laboratory to be completed this fall. Under the direction of Games Slayter, vice-president in charge of research, Dr. Crepps will be responsible for all tests of Fiberglas materials, both in the development and finished product stages.

♦Te Pang-hou, vice-president of Yungli Chemical Industries, Ltd., will receive honorary membership in the Society of Chemical Industry at its meeting on October 22. Dr. Hou supervised the construction of chemical plants at

Tientsin and Nanking. He holds degrees from Columbia University and the Massachusetts Institute of Technology. He is now in New York planning post-war expansion of China's chemical industry.

Walter Penfield

✦ WALTER PENFIELD, formerly manager of engineering for Pennsylvania Salt Manufacturing Co., Philadelphia, has been appointed works manager, and will be in charge of all the manufacturing activities of the company and all its subsidiaries, except the Pennsylvania Salt Manufacturing Co. of Washington. William F. Mitchell, formerly assistant to Mr. Penfield, continues in that capacity with the title of assistant to the works manager.

✦ H. HAROLD BULKOWSKI has been appointed to the research staff of Battelle Memorial Institute, Columbus, Ohio, where he will be engaged in electrochemical research. Mr. Bulkowski is a chemical engineering graduate of Carnegie Institute of Technology. Prior to joining Battelle he was associated with the Shell Development Co., Wilmington, Calif.

✦ HENRY T. PLANT, Richard A. Oriani and Alexander L. Wilson have joined the research and development laboratories of Bakelite Corp., at Bloomfield, N. J. Mr. Plant was graduated from Colgate University with a B.A. degree in Chemistry. Mr. Oriani was graduated from the College of the City of New York with a doctor's degree in chemical engineering, while Dr. Wilson has recently been with Carbide and Carbon Chemicals Corp.'s staff at Mellon Institute and has just received his Ph.D. degree from the University of Pittsburgh.

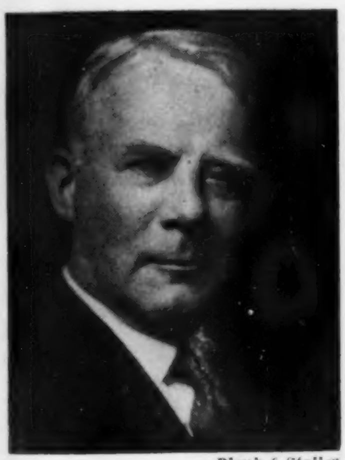
✦ MELVIN A. CROSBY is now chief engineer of Chemical Development Corp., Dayton, Ohio. Other additions to the technical staff of the company are Gordon M. Williams, John R. Fischer, Jr., and Elizabeth D. Strickland, research chemists, and Dr. Lena R. Ziegler, patent chemist.

✦ E. PERRY HOLDER, president of the Vulcan Iron Works, Wilkes-Barre, Pa.,

has been elected president of the Wickwire-Spencer Steel Co. Mr. Holder succeeds E. C. Bowers, who has been connected with the company since 1911. Mr. Bowers has resigned because of serious illness.

✦Hugh Hughes has resigned as director of the WPB Commodities Bureau. Mr. Hughes joined WPB in August, 1942, as Chief of the Aromatics and Intermediates Section of the Chemicals Division, and became deputy director of the Commodities Bureau in November of that year. Since January, 1943, when he was made director of the Bureau, he has supervised and coordinated the work of the chemicals, containers, cork, asbestos and fibrous glass, pulp and paper, and printing and publishing divisions of the WPB.

OBITUARIES



Blank & Stoller

Albion J. Wadhams

✦Albion J. Wadhams, vice president and manager of the Development and Research Division of International Nickel Co., New York, N. Y., died at his summer home at Elizabethtown, N. Y., on August 22 of a heart attack. He was 68 years old.

✦F. H. Rosencrants, vice president of Combustion Engineering Co., New York, N. Y., died of a heart attack at Scarsdale, N. Y. He was 54 years old.

✦James Morton, chairman of Morton Sundour Fabrics, Ltd., Carlisle, England, and president of Morton Sundour Co., of New York, N. Y., died at his home at Carlisle after an illness of several months. His age was 76 years.

Sir James received the Faraday Centennial Medal for his services to chemical science and industry.

✦Carl H. Hazard, president of the advertising agency bearing his name, died at his New York residence on August 23 after an illness of more than a year. Born in Stamford, Conn., he was 49 years of age.

✦George H. Gibson, head of the firm of Geo. H. Gibson Co., died July 28, following a heart attack.

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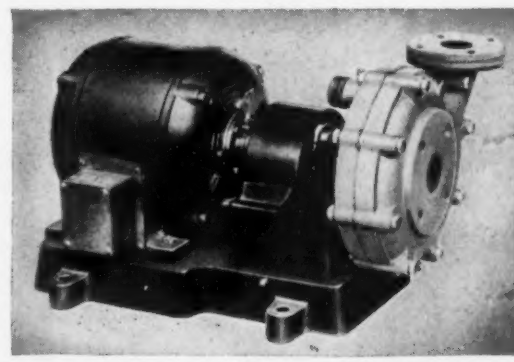

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MEETINGS AND CONVENTIONS

PROGRAMS FOR MANY AUTUMN CONVENTIONS NOW BEING COMPLETED

SOCIETY OF CHEMICAL INDUSTRY TO HONOR CHINESE AND RUSSIANS

HONORARY membership in the Society of Chemical Industry will be bestowed upon Dr. Alexei Bach, Russian biochemist, and Dr. Te-Pang Hou, Chinese industrial chemist, at a dinner meeting to be held at the Waldorf-Astoria Hotel, October 22, in New York. At the same time, Wallace P. Cohoe, of New York, will be inducted as president of the society.

This event, which will be under the patronage of King George VI, will be a continuation of the proceedings of the annual meeting the society held in London, July 9, at which Mr. Cohoe was elected president to succeed Dr. William Cullen, of London, and which was adjourned to reconvene in New York City. Dr. Foster D. Snell, chairman of the American section of the society, will preside.

NATIONAL SAFETY CONGRESS TO MEET IN CHICAGO

THE NATIONAL Safety Congress, in Chicago, October 5-7, will start one of the most important milestones in the history of the accident prevention movement. Last year's Congress started the machinery of the nationwide drive to save manpower for warpower. This year's program is devoted exclusively to accident problems which have a direct bearing on the prosecution of the war and winning it.

The National Safety Congress actually is 26 conventions within a convention, and annually draws 10,000 safety leaders from all over the country. Each of these 26 sections will conduct its own program, thus bringing emphasis to the particular accident problems current in every kind of industry.

One of the outstanding features planned for industrial leaders is the labor and safety session on October 7. Daniel S. Ring, director of the division of shipyard labor relations, U. S. Maritime Commission, will serve as chairman, and some of the nation's outstanding labor organization leaders will participate. All in all, there will be more than five hundred program participants in 200 Congress sessions. The list of exhibits for the exposition already exceeds 150. The Sherwin, La Salle and Morrison are the convention hotels.

Some of the Congress highlights will be sessions on labor and safety, the problem of women employees in industry, correlating safety with vocational training, importance of vision and visibility in safety considerations, health and accident problems of the woman war production worker, off-the-job safety, safety in aircraft manufacturing industry. The rubber section will hold sessions on October 5-6 at the Sherwin Hotel. Among the papers to be presented are "Safety Training in Wartime," by John I. Yellott, Illinois Institute of Technology; "Highlights in the Placement of Women in Industry," Ruth Stone, Women's Placement Section, Western Electric Co., Chicago; "Health Service in War Plants," C. O. Sappington, Industrial Health Consultant, Chicago; "Mechanical Safety in Plants Manufacturing Synthetic Rubber," E. T. Handley, Firestone Tire & Rubber Co., Akron, Ohio; and a symposium on solvents for synthetic rubber which will deal with ventilating problems, dermatitis and other questions.

JUNIOR CHEMICAL ENGINEERS OF NEW YORK ELECTS NEW OFFICERS

NEW OFFICERS for the coming year have been announced by the Junior Chemical Engineers of New York, 330 W. 42nd St., New York City. Raymond P. Devoluy, U. S. Navy Materials Laboratory, Brooklyn, N. Y., was elected president, while Edward T. Maples, M. W. Kellogg Co., will serve as vice-president. The new secretary-treasurer is Andrew E. Chute, Foster Wheeler Co., while the new assistant secretary-treasurer is Frank Melaccio, Fratelli Branca & Co.

Among the new committee chairmen elected were Francis B. White, Foster Wheeler Co., for inter-society activities; Randall D. Sheeline, Picatinny Arsenal, Dover, N. J., for program; John R. Callaham, *Chem. & Met.*, for publicity; and Edward T. Maples, M. W. Kellogg Co., for banquet.

INDUSTRIAL DIVISION OF A.C.S. TO HOLD SYMPOSIUM

THE TENTH annual symposium of the Division of Industrial and Engineering Chemistry of the American Chemical Society will be held at the University of Pennsylvania, Philadelphia, on the subject of "Agitation and Mixing." Because of the wartime duties of those who normally participate, it has been tentatively decided to limit the meeting to one day, Dec. 29, 1943.

Papers covering all phases of the subject, and orginating from work in the laboratory or applications in the plant, are desired. It is particularly hoped that descriptions of recently developed processes, such as catalytic alkylations, which depend on effective agitation for their success, will be offered. Those planning to submit a paper should communicate with M. C. Molstad, chairman of the symposium committee, Engineering Building, University of Pennsylvania, Philadelphia.

PAPER REQUIREMENTS CONFERENCE TO BE HELD IN CHICAGO

THE TECHNICAL Association of the Pulp & Paper Industry will sponsor an Army and Navy Paper Requirements Conference and Exhibit at the Palmer House, Chicago, Ill., September 21-24.

This meeting and exhibit is primarily for the benefit of the armed forces who wish to take advantage of this opportunity to discuss its packaging and container problems, particularly specifications for packaging materials to be used for foods and ordnance materials. A number of Midwest contractors are being invited to discuss mutual problems with the procurement specialists. An outstanding feature of the conference will be 10,000 sq.ft. of exhibit space at a theater now being prepared by the war department to display packages and to demonstrate proper packaging.

September 21 will be devoted entirely to addresses by officers of the technical branches of the Army, Navy and War Production Board to discuss paper and packaging in a number of phases. On Wednesday the Ordnance Packaging Staff of the U. S. Forest Products Laboratory will give a series of lectures.

CALENDAR

SEPT. 21-24	**Technical Association of the Pulp & Paper Industry, Wartime Service Conference, Palmer House, Chicago, Ill.**
OCT. 5-7	**National Safety Congress and Exposition, Hotel Sherman, Chicago, Ill.**
OCT. 13-16	**The Electrochemical Society, Hotel Pennsylvania, New York, N. Y.**
NOV. 14-16	**American Institute of Chemical Engineers, 36th annual meeting, Pittsburgh, Pa.**
DEC. 6-11	**Nineteenth Exposition of Chemical Industries, Madison Square Garden, New York, N. Y.**

There will also be a session devoted to the methods being developed by the Technical Association of the Pulp & Paper Industry for measuring water vapor permeability of sheets and packages, especially those used for wrapping food. On Thursday, sessions will be devoted to other technical subjects primarily of interest to pulp and paper makers.

JOINT FUELS CONFERENCE PLANNED FOR OCTOBER

A FURTHER announcement of the joint fuels conference of the American Institute of Mining Engineers and American Society of Mechanical Engineers, to be held at the William Penn Hotel, Pittsburgh, Pa., on Thursday and Friday, October 28 and 29, promises some very interesting and important conferences and papers.

Four technical sessions are scheduled: coal research, mining management, oil and gas, and the war program as it pertains to fuel. "Coal Faces Postwar Adjustment," by R. M. Weidenhammer, of Brookings Institution, and "Laboratory Field Tests on Coal-in-Oil Fuels," by J. F. Barkley and L. R. Burdick, of the U. S. Bureau of Mines, and A. C. Hersberger, of Atlantic Refining Co., are only two of the many papers.

AMERICAN GAS ASSOCIATION ANNUAL MEETING TO BE HELD IN MISSOURI

THE TWENTY-FIFTH annual meeting of the American Gas Association will be held in St. Louis, Mo., October 11-13, at the Hotel Jefferson. Sessions will be devoted to discussion of matters relating to the war effort and to the postwar period. A meeting of the Natural Gas Section will be held October 11. Meetings of the accounting, industrial and commercial gas, residential and technical sessions will be held on October 11 and 12. It is expected that there will be a general luncheon Tuesday, October 12, to be followed by general sessions in the afternoon. In keeping with the times, no entertainment features are planned.

BRITISH INSTITUTE OF PHYSICS ISSUES REPORT

REPORT of the Institute of Physics for 1942, just issued, shows that special attention has been given to urgent questions concerning the training and supply of physicists needed for war purposes. A good deal of attention has also been given to the best ways of insuring prospective physicists after the war an education that will enable them to make their fullest contribution to the service of the community. Normal activities of the Institute have continued with little modification on account of war circumstances. Among the new activities are the establishment of an electronics group and of the Joint Council of Professional Scientists, of which the Institute is one of the principal constituents. Exchange of information concerning physicists and their relation to the war effort has continued between the Institute and the American Institute of Physics.

At the annual general meeting of the Institute held on July 22 the following were elected to take office: President, Sir Frank Smith; vice-president, Mr. E. R. Davies, Dr. W. Makower, and Mr. T. Smith; honorary treasurer, Maj. C. E. S. Phillips; honorary secretary, Prof. J. A. Crowther.

DIVISION OF RUBBER CHEMISTRY TO MEET IN NEW YORK

THE DIVISION of Rubber Chemistry of the American Chemical Society will hold its annual fall meeting in New York, October 5-7, instead of convening with the society in Pittsburgh in September. This decision was reached by the executive committee of the rubber division when it became apparent that none of the available Pittsburgh hotels could adequately serve as headquarters.

Arrangements for the New York meeting are being handled by a committee headed by E. B. Curtis. The Commodore Hotel has been selected as headquarters, and the committee urges that all hotel and train reservations be made as soon as possible.

Censorship is being relaxed somewhat from certain phases of the synthetic rubber development, particularly with respect to compounding and processing, and in reporting work in this field members will have an opportunity to assist in the solution of any problems involved in the adaptation of the synthetic rubbers. The program has been deliberately scheduled for three days in order to allow time for discussion.

SELECTIONS FROM CONVENTION PAPERS

Nitrogen Supplies and Their Allocation....... 176
Zinc Yellow Inhibitor for Steel................ 178
Thin Oxide Films on Metals.................. 179
Powder Metallurgy.......................... 180
Derivatives of Lactic Acid..................... 180
Employment Allocation of Engineers........... 181

NITROGEN FERTILIZER SUPPLIES AND THEIR ALLOCATION

AS A RESULT of decrease in expected ordnance requirements and an increase in ordnance supply of anhydrous ammonia, the picture of nitrogen supply for 1943-44 has changed sharply from that which prevailed in the 1942-43 fertilizer year. In broad outline, the changes are: (1) an increase in the supply of ammonia and ammonium nitrate from synthetic sources; (2) a probable decrease

in nitrate of soda to conserve shipping.

In order to handle the available materials to the best advantage, it must be realized that neither ammonia nor ammonium nitrate can be stored in any quantity at the points of production. To keep the plants operating at maximum capacity it is necessary for their products to flow evenly into use. It is with this in mind that the WPB system of base allocation for the year 1943-44 has been devised. The commodities included were solutions, grained ammonium nitrate and ammonium sulphate for mixing, and grained ammonium nitrate for direct application.

For those manufacturers equipped to use them, solutions should be the nitrogen material used to the greatest possible extent in mixed goods. For the dry mixer, solid ammonium nitrate must take the place of solutions. In no case should ammonium sulphate be used as the primary source of nitrogen; it should only be used to attain the desired analysis after the maximum amount of solution or grained ammonium nitrate has been used.

Shipments of solutions and ammonium nitrate for mixing must be made evenly throughout the year to the various fertilizer plants and a firm order for each shipment must be in the suppliers' hands by the 5th of the month preceding the month of shipment. If the supplier does not have such an order, he may assume the shipment has been abandoned by the fertilizer manufacturer and offer such shipments together with any excess production available that month, to any customer in his territory who has an allocation and wishes to take delivery of the material in advance of his regular shipping date. Orders so obtained will be submitted on a supplemental list to the Nitrogen Unit for approval by the 25th of the month.

In the case of ammonium sulphate, the procedure is slightly different. Allocations of this material will be approved only in proportion to the manufacturer's acceptance of solutions or grained ammonium nitrate. At the same time the supplier's supplemental ammonium sulphate list will be smaller because the amount offered will consist only of abandoned shipments. The remaining ammonium sulphate production will be reserved for allocation as may later prove advisable.

Cal-nitro, uramon, and cyanamid for direct application, and nitrate of soda are not included in the present plan. These materials are primarily for direct application and are being reserved for distribution at a later date.

Edmund Rowland, chief, Nitrogen Unit, War Production Board, Washington, D. C., before the National Fertilizer Association, Hot Springs, Ark., June 21, 1943.

ZINC YELLOW IN INHIBITION OF CORROSION-FATIGUE OF STEEL

Corrosion fatigue of steel wire in sodium chloride solutions of concentrations ranging from 0.01 M to 1 M at room temperature was found to be slowed more by saturation with pigment zinc yellow than by addition of equivalent

potassium chromate. The increase in the life of the steel sample ranges from 15-115 percent, depending upon the inhibitor and the stress range.

Wire samples were tested in the Kenyon rotating wire arc fatigue machine. When the metal was active, the data formed a smooth curve, but when passive, a wide scatter of results was obtained, as a result of probability factors. Under these conditions repeated observations were required to provide reasonable precision of results. The life vs. stress curve does not flatten out, but continues to decrease with increasing life. On passivated short steel wire samples, (mounted so as to adhere closely to true arc curvature) compact, adherent mounds of corrosion product covering corrosion-fatigue pits were comparatively large and far apart at low stresses and were smaller and much closer at high stresses. This is believed to indicate that the localized cathodic current density required to protect a corroding area increases with increased strain in the metal. With long wire samples (with which there is a slight departure from arc curvature and from equal stress distribution), corrosion-fatigue occurs on the wire in spots distributed as above, but the attack develops more rapidly in areas of higher stress.

Addition of chromate to sodium chloride solutions extends the wire life without causing occasional acceleration of attack, which it may do under stressless conditions. Zinc ion increases wire life in either the presence or absence of chromate, due probably to its action as a polarizer of the corrosion cathode. Variation of pH from 6.5 to 7.6 in the potassium chromate-inhibited solution has no marked effect. The relation between sodium chloride concentration and the sample life is shown by data obtained at three representative stresses and three sodium chloride concentrations uninhibited and with each inhibitor.

Steel wire samples having a copper plate and others with a copper-over-zinc plate were tested to investigate the combined effect of plating and inhibitor. The attack was markedly accelerated by increasing temperature up to 50 deg. C, apparently by increasing in the function of chromate as a cathodic depolarizer. Exposure to radiation from a mercury vapor arc lamp affected wire life in inhibited solution, but not in uninhibited solution.

Colin G. Fink and W. D. Turner, Columbia University, New York and G. T. Paul, Princeton University, Princeton, N. J. before the Electrochemical Society, Pittsburgh, Pa. April 8–10, 1943.

TRANSITION STATE THEORY FOR FORMATION OF THIN OXIDE FILMS ON METALS

THE TRANSITION state theory of diffusion has been applied to the rate of oxidation of metals as a function of temperature. The expression involves an entropy of activation as well as the energy of activation. Experimental results indicate that the oxidation of iron, stainless steel and copper follows the parabolic law for certain temperature ranges and pressure ranges after a

certain initial period. The parabolic rate law constants are shown to follow a straight line when log K is plotted against $1/T$.

Energies of activation of 22,600, 29,600 and 24,900 are found for iron, stainless steel and copper, respectively. Entropies of activation are calculated to be −31, −35 and −6.8 for iron, stainless steel and copper, respectively.

Two terms are shown to be important: (1) the energy factor, and (2) the entropy factor. The difference between the oxidation rates of stainless steel and iron is shown to be due largely to an energy factor while the difference between copper and iron is one of an entropy factor.

E. A. Gulbransen, research engineer, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., before the 83rd meeting of the Electrochemical Society, Pittsburgh, Pa.

POWDER METALLURGY

IN THE CASE of refractory metals, such as tungsten, molybdenum, tantalum and columbium, it has been necessary to develop new methods for their production since the high melting points of such metals made their production by ordinary metallurgical processes extremely difficult, if not entirely impossible. Furthermore, in the case of such metals as tungsten, the fused metal would be of little value even if a technique could be developed to produce it in this way, since the large grains resulting from the freezing of the metal gives a very undesirable and weak structure.

In other words, tungsten made by pressing up a pure powder of the metal and heating to a temperature close to its melting point in an inert gas produces a product far superior to the melted metal.

So-called cemented carbides, that is, the carbide of tungsten, tantalum and other refractory metals cemented with a binder metal such as cobalt, can only be made by the methods of powder metallurgy, since a melted product in this case would be an entirely different thing. Of the more common methods, iron could be used as an example. Metallic iron of high purity can be made by the methods of powder metallurgy which has properties equal to or superior to the present commercial iron in its purest form. The metal so produced is finer-grained and has a higher tensile strength than commercial iron. This has also been found to be the case with steels produced by this method.

Clarence W. Balke, divisional research director, Fansteel Metallurgical Corp., North Chicago, Ill., before the Milwaukee Section of the American Chemical Society, Milwaukee, Wis.

USEFUL DERIVATIVES OF LACTIC ACID

LACTIC ACID is a substance known for thousands of years, but it is only recently that it has been thought of as anything more than the compound that makes sour milk sour. It can be made very easily and cheaply from whey or other sugar-containing agricultural byproducts. Recent research has made

possible new and extensive industrial uses for lactic acid.

Because of the unusual structure of this acid, it may be converted into several interesting series of products. The acrylates, which belong to one of these families of compounds, have the property of forming flexible, tough, transparent substances that can be used as flexible glass or for impregnating material in moisture-proof clothing and packaging. One acrylate produced in the laboratories of the U. S. Bureau of Dairy Industry is a combination of lactic acid from milk and a compound from oats.

When water is removed from lactic acid, its molecules join in long chains that no longer possess the chemical activities of the simple acid. This so-called polymerized lactic acid is a resin that can be used in making lacquers and protective coatings for metal containers such as the cans used in transporting milk and those used in canning evaporated milk, vegetables and similar products. Thus it may be substituted in some instances for metal coatings now on the restricted list. It may also be used as a glue in laminating wood and paper.

Lactic acid esters are particularly efficient solvents for many industrial lacquer resins. The slight tendency of these esters to form free lactic acid has prevented their very extensive use as solvents. That fault is being overcome in research now under way.

Earle O. Whittier, U. S. Department of Agriculture, before the Division of Agriculture and Food at the 105th annual meeting of the American Chemical Society, Detroit, Mich.

• • •

Approximate Allocation of Engineers According to Type of Employment[1]

Manufacturing	105,000
Mining	12,000
Construction	20,000
Private consultants and staffs	10,000
Transportation, communication, public utilities	40,000
Teaching	5,000
War Department (uniformed and civilians)	40,000
Navy Department (uniformed and civilians)	13,000
Other Federal agencies	14,000
State, county and municipal governments	21,000
	280,000

[1]National Roster of Scientific and Specialized Personnel of the War Manpower Commission, April 21, 1943. Figures as of the beginning of 1943.

• • •

Job accidents in the United States from July 1940 to January 1943, the 30 months covering the defense program and the and the first year of war, brought death to 48,500 workers, cost 258,000 an eye, finger, hand, arm or leg, and laid up 5,300,000 for an average of three weeks each. Days of work lost in these accidents totalled 110,000,000—more than 375,000 man-years!

In the first eighteen months of the war, our announced battle casualties have numbered 12,123 dead, 15,049 wounded; 40,435 missing and 10,628 prisoners of war, a total of 78,235.

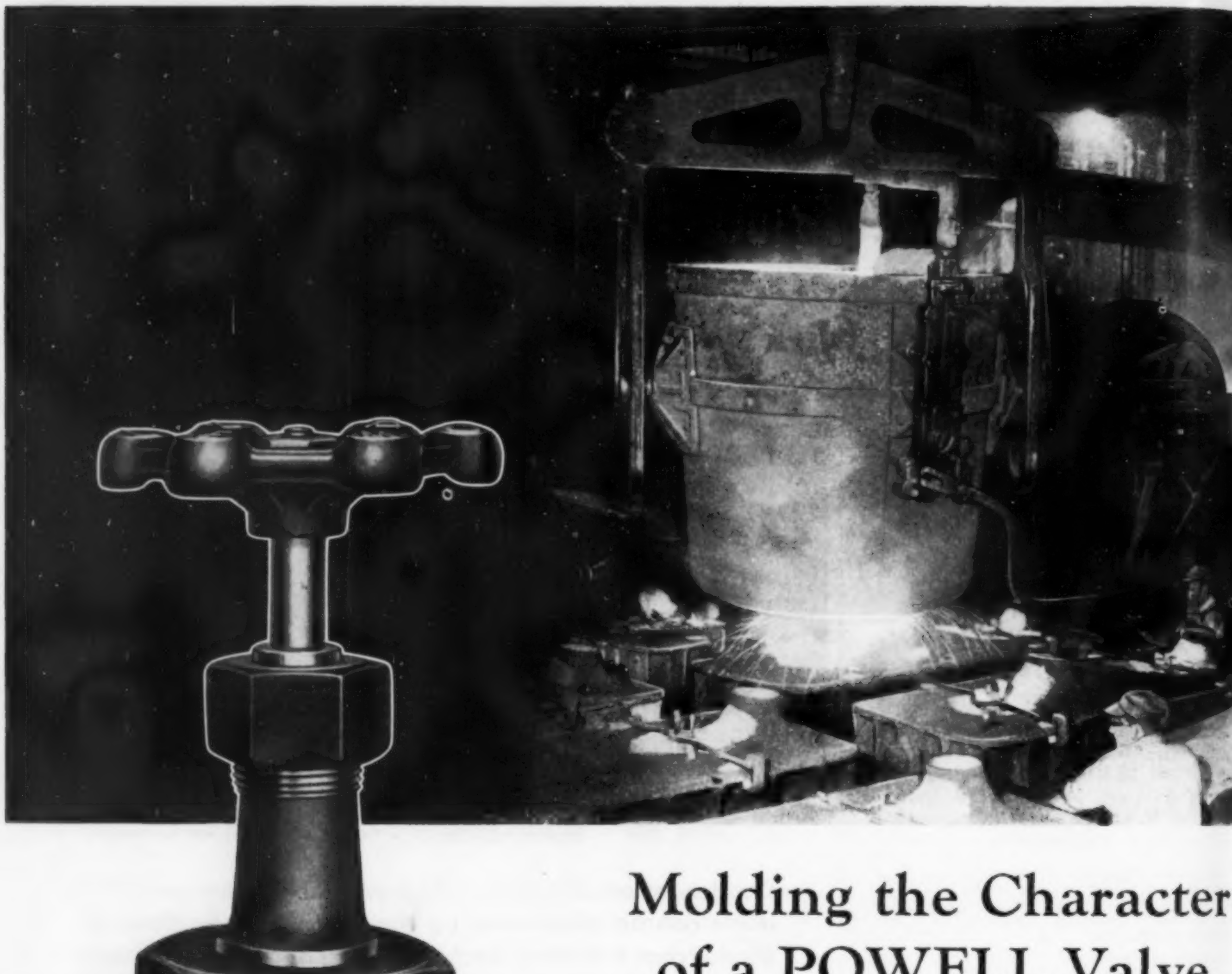

Fig. 1988—A 250-pound screwed-end Globe Valve with malleable iron body, union bonnet, bonnet ring and packing nut. Has cadmium-plated carbon steel stem, stainless steel seat and hard bronze, semi-cone, plug type disc. Made in sizes 1/4" to 2", inclusive.

Also available with stainless steel stem (Fig. 1990).

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FROM THE LOG OF EXPERIENCE

Dan Gutleben, Engineer

OILER GEORGE, small of stature, dropped in during the quiet of a Sunday morning to lay his worries before the boss. He said he was 53 and he forsaw a time when his weakening feet would no longer permit him to ply his present job. In order to anticipate this eventuality he desired to enter a bid for a watchman's berth. Our answer was that we were loathe to lose an expert oiler for the price of a bum watchman but would take care of the situation when the proper time arrived.

George's parents brought him from Scotland before he was old enough to walk but the Scottish instinct was inherited. While he was still a youngster he stowed away on a sailing vessel. This experience satisfied his craving and he became an addict till he had 6 sailings to his credit. One of these trips brought him to Valparaiso just at the time a 5-mile tunnel was being bored under the Andes to expedite traffic between Chile and Argentine. He got a job with a crew of colored muckers, and was the only pale-face in the camp. The muckers didn't like it and there were threats of a stilleto between his ribs. One day at mess, where the standard meal consisted of a big bowl of puree with a bone of meat, a vicious mucker heaved his bone at George and struck his coup. George countered with his bowl. This precipitated a riot and while the muckers were lambasting each other, George escaped under the table. To save him from the cannibals, the engineering staff —a group of Englishmen—transferred him to the surveying crew, the while raising his pay from 4 pesos per diem to 9. After a year of this he stowed away on a brigantine for San Francisco. The 58-day schedule dragged to 78 and for 20 days the sailors subsisted on split peas and sow belly.

TWO RAW SUGAR MELTERS, consisting of 87" perforated baskets hung on vertical revolving spindles like a centrifugal, can melt 12,000 tons of Cuban raw sugar per week. During this period they collect floating debris which is continuously raked out, together with sundry metal scrap which requires removal at the week-end. The flush period following the last war fostered the gambling proclivity of the Cuban peons. The great game flourished in the raw sugar sheds in Cuba, and if an occasional American quarter or a Cuban peso fell by the wayside to become buried in the sugar, it wasn't worth the search. These coins also collected in the melter baskets in Philadelphia and furnished the incentive to thorough week-end cleaning. When the sugar market declined, the gambling accessories in Cuba grew scarce, the week-end perquisites of the melter operator in Philadelphia vanished and so did the week-end eagerness to perform. To revive interest, Bill Booth surreptitiously dropped a dollar into the melter just before the shut-down and then stood by to make sure that, this time at least, the "polander" did a thorough job. The reward stimulated the effort and relieved Bill's mind. Bill found that the effect of the stimulus petered out after 4 months and so his annual contribution was equal to a year's subscription to *Chem. and Met.*

Bill wore a carnation in his lapel. When not harassed by the responsibilities of his job, he was pleasant as to looks and demeanor and had a generous disposition. When he first came to the refinery and was pointed out as a consequential person, a Shackamaxon Ave. matron, well-known for her sociability, sought opportunity for an introduction. The regular morning hosing of her sidewalk coincided with Bill's march to the refinery. One day an unruly hose "accidentally" spread water on Bill's freshly creased trousers. Forthwith, respondent offered profuse apologies and insisted that Bill come into the house to be brushed off. Thus the friendship started.

US PLANT ENGINEERS are "just like that." About 10 years ago the Chronicler was commissioned to install oil furnaces in the char house. It was known that Win Black, plant engineer in the Baltimore refinery, had a superior installation and a request was made for drawings. Win's answer was, "Come and get them." The procedure of getting them was accompanied by a free lunch and much swapping of sugar experiences both for pleasure and profit. After our job was finished, having incorporated improvements suggested by Win's experience, Walter Smith, plant engineer of the Philadelphia refinery of Win's company, called up to request drawings. Again the answer was "Come and get them." And thus with the accumulated experience of one of his own plants and that of a competitor's, Walter made further improvement.

A NOBLE SOUL dwells in a healthy body. Admiral Grayson, former guardian of the health of the Presidents, specified five essentials to good health, to wit—system, diet, exercise, sleep, sense of humor.

The rules of health have not changed since Methusala, but survival of the deficient now obtains under benefit of the fittest. "Health", according to Jim Corbett, "is man's normal condition. He must do something foolish to lose it." Hopeful youth is tempted to postpone the discipline that the maintenance of physical and mental health demands. Like life insurance, it does not make immediate returns. There is nevertheless an obligation before God and man to keep the body well. The engineer owes it to the House that pays his wage to maintain efficient performance and a patient disposition throughout his "indenture." Dr. Van Loon propounds that stomach aches, headaches and sluggish bowels have played a great role in history. Furthermore, "when Aunt Emily takes 30 years in which to die she generates into an expense and becomes a bore."

IN THE GOOD OLD DAYS of the buyer's market a letter was received from the "Castle Salvage Company: Liquidators of Going Plants, Dismantlers of Obsolete Plants." They listed a quantity of tanks upon which tenders were solicited on the basis that—"On each and every item listed above, no reasonable offer will be refused. In fact we can practically say, 'Your price is our price!' All we ask is that when you make an offer, you remember, that there is still a God and a Day of Judgment."

DOC REICH'S old professor in Berlin never agreed. If you suggested that the weather was fine, he would look up and find a light nimbus cloud in the sky and obstreperate that the prospects for good weather were not encouraging. Then if a fellow followed with the prognostication of a cloudy day, he would look up again, and he'd find on the contrary, the weather is clearing!

BEFORE THE PRESENT RESTRICTIONS, Doc turned in his Chrysler that he had had less than a year and exchanged it for a new one. He said the repair bills on the old one were mounting too high and, in fact, reached $17 a month. When he first started to drive, he wrapped it around a telegraph pole which he reported was done to avoid a careless jay-walker. He didn't damage the car greatly and anyhow, he would rather hurt the car than the pedestrian. All that the car suffered, according to his report, was some slight scratches. It was learned accidently some time later that the repair bill was 300 dollars. Anyway, Doc exhibits nerve, deaf as he is, to start driving after 40. He had never before sat behind the wheel. The basic training was a little rough and costly but he has arrived at complete expertness.

THE GREAT CONVENIENCE of the dictating machine consists in the promptness with which it unloads a job from the neck of the engineer onto some man Friday out in the plant. After a trip through the works, the notebook of reminders is quickly expanded into memorandums directed to the various and sundry "doers." It is far more conservative of the engineer's time than

the telephone. Furthermore, the receiver of the memorandum does not have to break an important train of thought or have his nerves jarred by the shrill signal of the bell. He "reads and heeds" the message at his convenience, without risk of misunderstanding or forgetting. If the message is one that requires retention for a period, it is filed in the loose-leaf cover which is carried in the hip pocket of every man on the job who has occasion to read or to receive messages from the engineering department.

ILLUSTRATIVE of the byproducts activities of the Lehi, Utah sugar house, the "Louisiana Planter" of Feb. 1897 reports that Supt. Granger, Agriculturist Austin and Sugar Boiler Gardner left Lehi with a shipment of 200 pulp-fed steers destined for Chicago. At Denver there was one of those long division-point delays which provided opportunity for feeding and watering the stock. Casually the boys strolled around the local stock yards and were surprised to learn that beef brought a higher price in Denver than it did in Chicago. Accordingly they made a quick sale in Denver and beat it back to Lehi. The style of their travel is not recorded but presumably they rode in the caboose according to custom. They doubtless also had their boots on and were equipped with pitch forks and water buckets. In the same issue of the Planter reference is made to the financing of a small sugar house (beet or cane not disclosed). It was not possible to secure a loan through the regular banking channels and so application was made to a pawn broker. The "Uncle" agreed to advance the money, but by way of security, demanded an inventory of the weight of the brass and copper parts included in the plant.

THE PROPOSITION has frequently been advanced that small sugar houses, community owned and collectively operated, would keep the octopus off the farm and leave the processing profit with the producer. It would maintain grower interest in the factory and hauling distance would be short and "sweet." A builder who extracts his livelihood from the construction of the factory could encompass such an operation, but industrial ownership and buying-and-selling are not among the accomplishments of the farmer who spends his time in the fields from sun to sun. An agriculturally-minded enthusiast from Utah picked Maxwell, New Mexico, as the spot for the experiment and proceeded under inexpert engineering advice to design the factory. This was in 1924. He wished for a 250-ton daily capacity but his arithmetic achieved less than half of this. The neighborhood farmers signed up for beets but not for stock. Sugar machinery of such small proportions required special design and the builders thereof demanded cash. Standard equipment, such as pumps, tanks, boilers, and engines, could be picked up at junk yards. Financing developed into a nightmare. Stock and bond certificates substituted in lieu of cash in cases where

the seller's resistance could be overcome by the enthusiasm of the Promoter. Tom Sasse, versatile sugar tramp, was placed in charge of the construction. He craved excitement. He could raise beets, erect factories and operate the works. He had no prejudice against work. Time was made for slaves!

When the beets began to roll in, the two old boilers could not produce enough steam. The Santa Fe railroad company came to the rescue with a pair of locomotives and Tom tuned up the works, albeit with the accompaniment of a good deal of grief. The payroll account expired before the crop was finished. The end was disastrous and dramatic. As Tom was tossing on his cot* in the laboratory, unable to sleep, his meditation suddenly brought him to a solution of his distress. He tucked his shirt into his pants, beat it to the front door where the morning shift was just coming in and then yelled at the top of his voice, "Hey you numbskulls, shut 'er down! We haven't got a dime to run on." The rest of the beet crop was sent to the nearby Swink factory and Tom moved on across the Atlantic to a tour of duty as instructing operator in one of the new British beet sugar houses.

The bonds gravitated into the hands of a coal mining company. They sought to take over the stock through sheriff's sale but were stymied by New Mexico's "5-year" redemption law. For 15 years the factory lay idle. In 1940 it was taken over by an "industrial undertaker" from New York and dismantled.

* When this was submitted to Tom for review he replied that he had no corrections to offer except that he had no cot!

A FANTASTIC HYPOTHESIS has been advanced that the activated carbon made out of the marc from which a juice is extracted produces the most efficient decolorizing agent for that juice! That is to say, the best decolorizer for cane juice is made out of cane molasses or so-called wastes. Analogously the most effective activated carbon for clarifying beet juice would be made out of the end products of the beet sugar factory which presently are classed as wastes. Parenthetically, our Doc, in elaborating cane molasses after the sugar had been removed by fermentation in the alcohol plant, produced an activated carbon with an amazing decolorizing capacity.

LAST NIGHT, some broker handed Bill Scott a raw deal. Bill grew wrathy, and the longer his mind dwelt on the circumstance, the redder became his view. He spent sleepless hours during the night formulating a proper and fitting tongue lashing to be meted out to the offender in the A. M. By 9, Bill's temperature had reached the boiling point. Just as he was about to grab the receiver, his phone rang. Over the wire came the broker's mellow voice, "Good morning, Bill! I made a dastardly mistake yesterday and I'm sorry. I was entirely wrong and hope you will allow me to apologize."—The disappointment almost floored Bill. A whole night's effort gone for naught!

NEWS FROM ABROAD

INTERNATIONAL SCOPE OF BRITISH CHEMICAL INDUSTRY EMPHASIZED BY RECENT WORLD DEVELOPMENTS

Special Correspondence

INTERNATIONAL relations of British chemical industry have been very much in the news of late. An American was elected president of the Society of Chemical Industry for 1943–44; Wallace P. Cohoe is the first U. S. citizen to occupy that office since Arthur D. Little held it in 1928–29. He may not be able to visit England during his term of office, but he will be officially installed at an adjourned meeting in New York, Oct. 22. Later he will go to Montreal to attend the annual meeting of the Canadian Council in Montreal, and his election serves to remind British chemists of the international character of the Society. British-American chemical relations have been brought to the notice of the public also in a very different way by the publicity given in and outside Parliament to the anti-trust charges against U. S. chemical companies in which one leading British producer was mentioned. From yet another angle the international character of chemical industry has been illuminated by the arrival of the first consignments since 1940 of rock-phosphates from North Africa and by the prospect of an early resumption of sulphur shipments from Sicily to England; and these important raw materials have also been, or will be, shipped to other Allied and neutral countries. Talks between British and Norwegian whalers have drawn attention to the important production of whale oil. Finally, Colonial produce and industries have been very much before the public eye.

Anti-Trust Charges

The monopoly charges against leading U. S. chemical producers caused great excitement in England because Imperial Chemical Industries Ltd. which was cited as partner in the alleged conspiracy, occupies a predominant position in British industry and because it was wrongly inferred that the accusation was one which could be made also under British law. There is nothing resembling the anti-trust laws of the United States in British law, although, at least in the chemical industry, concentration

has in England as in the leading countries of Europe gone even further than in America. There is only one Imperial Chemical Industries Ltd. in Great Britain (with fully or partly owned but fully controlled subsidiaries throughout the British Empire) just as there is only one I. G. Farbenindustrie A. G. in Germany (with a tremendous controlling power in all the countries overrun by German troops or infested with German "economic experts"), one Montecatini in Italy, and one Kuhlmann in France. It would be idle to deny that the monopoly position has aroused considerable misgivings in England, but whatever anxiety may be felt on the score of monopolistic tendencies, none exists as to the efficacy of this form of organization, and no supported attacks have been made against the company because of any international cooperation.

The charge of wartime dealings with the enemy has been categorically denied by I.C.I., but the chairman of the company used the opportunity provided by discussion in Parliament and press to drive home the truth that cartel agreements are inevitable whatever their desirability and that the trend towards cooperation and large-scale units in trade and industry cannot be arrested with impunity. This view is generally accepted by knowledgeable observers, but even Lord MacGowan admitted, and indeed proposed, a system of registration (involving government consent) for economic cartels which would ensure public control over this potentially dangerous development. The idea that cartels are harmful is not shared by responsible British authorities. Even before the war the British Government played an active part in the formation of international control committees for such commodities as rubber, tin and sugar, and the need for concerted action in many industries where technical capacity exceeds economic demand has become more evident since. Similarly the British Government does not oppose the emergence of large industrial combines in itself. The war has shown that these big industrial units can play a very valuable and indeed indispensable part in wartime economy.

Dehydration Plants

It was only a few weeks ago that it was announced that Imperial Chemical Industries Ltd. would undertake the erection of thirty plants for the dehydration of vegetables for the Ministry of Food which needs their production for the Forces. This undertaking has little in common with ordinary chemical operations, and yet the authorities thought it best to entrust a large chemical company with the work. Incidentally, it may be stated that the first three dehydration plants for vegetables are already in operation, eleven were under construction at the end of July, and all were to be brought into production by October. Imperial Chemical Industries Ltd. has also taken over a German-owned chemical firm—Albert

Products Ltd.—from the Custodian of Enemy Property, a transaction which was the subject of another question in Parliament. So was the number of I.C.I. peacetime officials now serving in the Ministry of Supply and other government deparments. According to all available information the number is very high and has therefore aroused misgivings, but it is generally realized that in present circumstances reliance on large private companies and their personnel is necessary and, most observers are inclined to agree, desirable. Nor does government reliance on private firms end with the big companies. One of the most interesting features of recent wartime control policy has been the evident desire of the authorities to let private firms share in the tasks of control by cooperation in distributing agencies, and the concentration scheme for industry has also furthered cooperative methods. Although directly due to wartime exigencies, shortage of labor, official direction of imports, etc., these developments have a very important bearing on postwar developments. Commodity Control is bound to stay in England for considerable time after the war, and the cooperation begun under the impact of war is more than likely to continue for some time. The main postwar problem will be to re-introduce private enterprise of a healthy kind into an economy used to, and organized for, a large measure of official control.

This combination of government support and private enterprise will be equally important in the industrial development of the British Colonies. Development of secondary industries is considered essential for the raising of the standard of living in these territories and should not adversely affect the export prospects of industrial countries though it may entail certain changes in the character of Colonial imports. It is interesting to note that the manufacture of sulphuric acid is one of the first industrial developments envisaged for East Africa. More likely than not many secondary industries will be based on local raw materials thus permitting their exportation in a more valuable, because more concentrated form. New industries for the local market are certain to provide great opportunities for the chemical exporter in Europe and America, but it is probable that this kind of trade with the Colonies will demand longer credits and generally bigger financial investments than exports in other directions. Moreover, a large expansion of imports must be accompanied by a similar increase in exports which in turn depends upon the willingness of industrial countries to accept other goods besides the most common raw materials.

Agricultural Chemicals

The erection of dehydration plants for vegetables by a chemical company mentioned above is just one instance of the increased interest given to agriculture by British chemical producers. The expansion of food production in England and the assurance of profitable prices

has greatly increased the importance of the farming community as a buyer of chemical products, with a consequent increase in undeveloped opportunities in this long neglected market. The demand for chemical fertilizers has grown to such an extent that both the quantity and type of fertilizer permitted for specific crops had to be controlled. In Scotland standard compound fertilizers will now be used. The standard grade for potatoes contains 6-7 percent nitrogen, 9-10 percent potash (K_2O), 8 percent of soluble phosphates and 1-2 percent of insoluble phosphates, that for grain contains 6 percent of N, no K_2O, 10-12 percent of soluble phosphates and 1-2 percent of insoluble phosphates. Standardization will help the fertilizer manufacturers to speed up deliveries, but even so farmers must take larger quantities before the end of this year if the total tonnage is to be delivered by next spring. Other new developments are the use of tear gas (chlorpicrin) for horticultural soil treatment which is only little less effective than steam sterilization, a new synthetic insecticide of unknown composition and gray powder-like texture said to be more efficient than derris against the turnip flea beetle, and phenothiazine as a vermicide for sheep with increases in weight of up to 5 lb.

Wartime Adjustments

One of the most remarkable features of wartime adjustment in the British chemical trades has been a trend towards more cooperation and centralization. This tendency has been deliberately encouraged by the authorities in more than one way. When war broke out and commodity control became necessary, the Controllers were chosen from the industries concerned, directive powers were vested in existing trade associations, and new associations were formed to handle imports or distribution of certain materials. This trend still continues. Hardly a month goes by without a new agency for the marketing of chemical materials being formed as a "company limited by guarantee", the somewhat rare legal construction chosen by the authorities for this purpose, and quite a number of new trade associations have come into being.

At the same time concentrations and amalgamations have been encouraged and, indeed, enforced by the authorities with a view to the release of labor and plant for other purposes. The most efficient firms have been given "nucleus" status to serve as absorbing organization for several firms some of which must close down their plants because of lack of orders or supplies. While thus small firms have been merged under official regulations, bigger firms have generally been able to carry out the desired measure of concentration within their own organizations, a fact which has proved a great advantage. While thus small firms have by necessity disappeared (though not to any large extent in the chemical trades), the cooperation of traders in import and distribution agencies has had very much

the opposite effect: Firms which might have been forced to close down because of lack of supplies have been kept in existence, if only as sub-agents for a government department. In this way consumers can still be supplied through the usual channels at comparatively little cost and with a minimum of disturbance.

Expansion of Firms

The trend to cooperation and bigger units in industry and trade has also been furthered by the horizontal expansion of some leading firms. Thus the leading chemical combine in Great Britain has greatly increased its interests in the field of plastics and pharmaceuticals. The plastics industry finds especially much attention. The two leading rayon producers have taken steps to participate in any future expansion, and one of the biggest paint manufacturers has just announced his intention to enter this field, for which he has formed a special subsidiary. In the pharmaceutical trade several of the biggest firms a short while ago formed a company for joint research and development work, a move which was soon followed by an announcement from another side that research in this field was to be greatly extended.

There is no doubt that the great firms have a considerable advantage over smaller companies in the matter of research which is particularly expensive in the chemical industry. The large funds set aside for research by various government departments are in principle of equal benefit to all manufacturers, but in practice it has been found that only those firms are able to derive the full benefit from this government-sponsored research work which are in a position to apply the knowledge gained by it in their own laboratories. The war has given a stimulus to the pooling of knowledge, has helped to break down antiquated barriers of trade secrecy and patent protection, but this pooling of knowledge is largely a matter of the big firms which alone can make really valuable contributions to the common pool.

Tar Shortage Areas

A new development in British chemical control is the designation of certain parts of the country as "tar shortage areas" by the Coal-Tar Controller. Tar distillers in these areas will, unless their stocks exceed amounts specified to them by the Controller, supply tar and tarmacadam only for Air Ministry requirements or on the authority of a permit from the Ministry of War Transport. This seems to be the first case of "zoning", a method of dealing with regional problems introduced in order to save transport. While generally great care is taken to assure equal supplies for all parts of the country, it cannot always be arranged without undue demands on available transport that this aim is achieved, and the special restriction imposed on certain districts is the result. Before the war rather less than half the tar produced in Great

Britain was used for road surfacing. The remainder was distilled for the production of creosote and pitch. Creosote was used as a wood preservative and as a raw material for hydrogenation, while pitch was either exported or used for briquetting small coal.

PLASTIC DEVELOPED FROM JUTE WASTE IN INDIA

"JUTELITE," a plastic developed from the jute waste of Indian mills, has been evolved at the laboratories of Calcutta University. The waste is converted into a molding powder by heating it under pressure and using certain acids and chemicals. A chocolate-brown thermo-setting powder results, which, it is stated, can be molded in 3 minutes at 150 deg. C. at a pressure of 3,000 pounds per square inch. The addition of a filler increases the hardness. A powder yield of almost 60 percent is obtained from the waste.

The molded products are sufficiently hard to be drilled and have a glossy appearance. Further research is being carried out to determine their properties.

SMALLER SUPPLIES OF PALM KERNELS IN NIGERIA

DESPITE a vigorous campaign to increase production of palm kernels in Nigeria for export to the United Kingdom, gradings for export decreased by 11,967 tons during the first quarter of 1943. Goals set for production of palm kernels and palm oil are 371,150 long tons and 172,000 long tons respectively.

The small groundnut (peanut) yield reflects last year's crop failure, said to have been caused principally by lack of rainfall in the Northern Provinces.

JAPAN REPORTS PROCESS FOR HIGH-OCTANE GASOLINE

AS A RESULT of research carried on at Koyoto Imperial University, a process has been developed in Japan for extracting high-octane gasoline from the carbonic-acid gas from hot springs, a Japanese broadcast, claimed. This invention, it was stated, makes it possible to obtain from carbon dioxide what previously had been produced only through synthesis of carbon dioxide and hydrogen. It is planned to use the process on an industrial scale.

TANNING MATERIAL SHORTAGE IN SOUTH AFRICA

TANNING materials are still the chief industrial chemicals needed in the Port Elizabeth area of South Africa.

Before the war, most of the chemicals needed by the tanning industry were obtained overseas, except for lime and sulphuric acid, which were available in the Union. One firm is now manufacturing lactic acid in quantities sufficiently large to supply a considerable portion of the local demand. Sodium bisulphite and sodium thiosulphate are also produced for tanning factories.

ABSTRACTS FROM FOREIGN LITERATURE

DEHYDRATED CASTOR OIL

Dehydrated castor oil has certain properties which are intermediate between those of linseed oil and tung oil, and it already occupied second place in drying oil consumption in North America during the first half of 1942. This expansion in the consumption of dehydrated castor oil is of considerable significance to Brazilian industry since that country is in a position to supply its own raw material as well as produce the finished product.

Almost all the methods for dehydration of castor oil involve thermal treatment at 180-230 deg. C. in the presence of an acid catalyst or a catalyst capable of providing small quantities of mineral acid for the decomposition. Such catalysts include the alkali bisulphites, sulphuric or phosphoric acids, sulphoricinoleates, etc. The treatment, which is best carried out in an atmosphere of inert gas to avoid darkening of the oil, should be accompanied by efficient agitation.

Since castor oil contains 84-87 percent ricinoleic acid, complete dehydration would eliminate about 5 percent water. Actually, about 4.7 percent is removed in plant practice. Although the process seems simple enough, it involves a number of difficulties, such as polymerization and hydrolysis of the oil during dehydration.

However, there is also some market for more or less polymerized oils of varying viscosities. These are obtained at a high temperature (280 to 310 deg. C.) and without a catalyst. The polymerization, however, should not pass a certain point since dehydrated castor oil, like tung oil, gelatinizes readily.

On the basis of experimental work conducted on this subject, the decision has been made to build in Brazil a commercial plant with a capacity of approximately 60,000 lb. of oil per month.

Digest from "New Developments of the S. A. Industrias Reunidas F. Matarazzo in the Field of Chemistry in the Last Three Years. Cooperation for the Industrial Independence of the Country" by Benedito Grisanti, *Revista Brasileira de Quimica* XV, No. 86, 87–89, 1943. (Published in Brazil.)

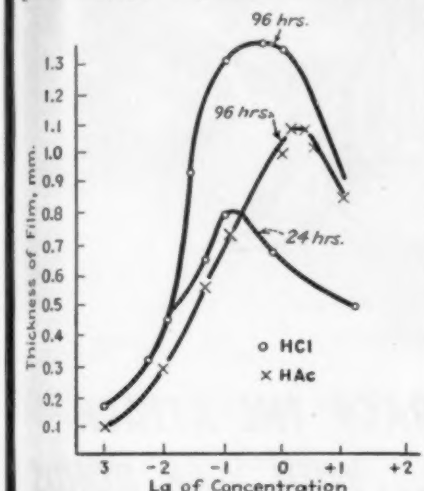
MACROFILM ON BORON GLASS

An even, durable and lustrous protective macrofilm that is 0.5 mm. thick can be produced on the surface of sodium borosilicate glass. The thickness and nature of the film will depend on the composition of the glass, the thermal treatments and the preliminary treatment to which the glass surface is subjected.

A number of different acids, of varying concentrations, can be used to produce this film. The boron glass is placed in the acid, with the film forming rapidly at first and then more slowly. Raising the temperature of the

solution accelerates the growth of the film but this has less and less effect as the film grows thicker. The type of acid and its concentration also affect the growth of the film.

The accompanying diagram shows the action of hydrochloric and acetic acids at different concentrations on boron glass through a period of 96 hours.



Both curves reach their peak at an acid concentration of from 0.1 to 1.0N. The appearance of the film varies with the concentration of the HCl. At concentrations up to 0.1N and above 2N the macrofilm is transparent, while at concentrations of from 0.1N to 2N it is cloudy and very opalescent. There is no such difference when acetic acid is used.

This macrofilm formed on sodium perborate glasses differs conspicuously from films formed on ordinary silicate glasses by the large size of its pores.

Digest from "Production of a Macrofilm on Sodium Borosilicate Glasses and Its Properties" by I. V. Grebenshchikov and O. C. Molchanov, *Zhurnal Obschei Khimii* XII, No. 11–12, 588–597, 1942. (Published in Russia.)

MORDANTS FOR COTTON DYEING

SINCE cotton fibers do not have direct affinity for basic dyes, it is necessary to use mordants in the dyeing process, preferably a tannin which is fixed on the fiber by a metallic salt. This is usually some salt of antimony.

Mordanting is generally carried out in a bath containing about 10 times as much water as the weight of the fiber. Tannin concentration of 1-6 percent is ordinarily used, depending on the intensity of tone desired. The fiber is introduced into the bath which has previously been heated to 90 deg. C., stirred for half an hour, and then permitted to stand for some 6 to 12 hr. After this the cotton fibers are wrung out by centrifuge and placed in the fixing bath. This usually consists of a solution of tartar emetic. The fibers remain in the bath for 15 min. with stirring, after which they are removed, washed and finally centrifuged.

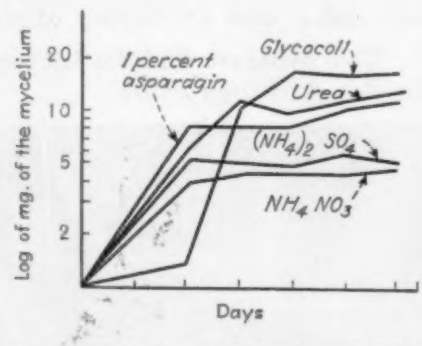
Iron can be used instead of antimony to fix the tannin. The cotton is treated with extracts of sumac or tannin and an iron acetate solution of approximately 2-3 deg. Bé, for about a quarter of an hour.

Some basic dyes can be applied with oils. This, however, results in more vivid but less durable tones than when tannin is used.

Digest from "Cotton Dyeing" by Antonio Furia. *Revista Brasileira de Quimica* **XIV**, No. 81. 264–7. 1942. (Published in Brazil.)

THIAMIN

THIS vitamin compound can be determined biologically by the use of *Phycomyces blakesleeanus* which is extremely sensitive to small quantities of thiamin and grows rapidly in a culture containing an addition of this compound. The optimum growth occurs at a pH of 6 to 6.5. The nitrogen needs of the fungus can be supplied by urea, which is much cheaper than asparagin and can be used to replace most of the 4 percent asparagin usually required. The accompanying graph shows the results when glycocoll, urea, ammonium sulphhate and ammonium nitrate are used as the



source of nitrogen. The control medium contained 1 percent asparagin and 0.166 percent KH_2PO_4.

From 2 to 5 mg. of crystallized thiamin hydrochloride were dissolved in 1 percent acetic acid and heated at 110 deg. for 15 min. This solution was diluted with distilled water to obtain a solution of 1 γ of thiamin per 1 cc. Portions of from 0.05 to 0.5 γ were added to each 25 cc. of the basic culture.

A 0.5 cc. aliquot of a suspension of *Phycomyces blakesleeanus* was added to each culture. After 7 to 10 days growth under the proper conditions, the fungus was filtered out from each specimen, dried and weighed.

Digest from "Determination of Thiamin. Modification of the Schopfer Method," by Jose M. Chaves and Italo V. Mattoso, *Anais da Associacao Quimica do Brasil* **I**, No. 4, 250-263, 1942. (Published in Brazil.)

REFINING OF NICKEL

IN THE electrolytic refining of nickel, iron must be removed from the electrolyte to prevent its contaminating the cathode metal and making it crack. Cobalt, which is of considerable commercial value, is removed at the same time by oxidation with so-called black nickel hydrate (a mixture of the hydrates of NiO, Ni_2O_3 and NiO_2). Black nickel hydrate is produced chemically by oxidation of nickel salt solutions in an alkaline or neutral medium.

It has been found practical to produce this reagent electrochemically, which would be especially convenient for nickel refining plants situated far from industrial centers. Nickelous hydroxide is oxidized electrolytically by means of

sodium hypochlorite in a solution of sodium chloride. The nickelous hydroxide was prepared by anodic solution of the electrolytic nickel in a 1-5N sodium chloride solution, withh a current density of 0.05-0.30 amp. per sq.cm. The yield was almost 100 percent in relation to the current. The attached table shows the yield of nickelous hydroxide at different current densities.

Production of the nickelous hydroxide and finally black nickel hydrate can be carried out simultaneously in the electrolytic cell by using at the same time insoluble graphite and soluble nickel anodes. By regulating the strength of the current through these two circuits, the nickelous hydroxide produced at the nickel anode can be oxidized by the hypochlorite formed at the graphite anode.

Digest from "Electrochemical Oxidation of Nickelous Hydroxide" by N. P. Fedotiev and V. V. Svechnikova. *Zhurnal Prikladnoi Khimii* XV, No. 3, 105–119, 1942. (Published in Russia.)

Production of Nickelous Hydroxide by Electrolysis

(In 5N sodium chloride solution at 20 deg. C. and distance between electrodes of 5.0 cm.)

Current Density, Amp. per Sq. Cm.	Voltage	Yield in Relation to Current, Percent	Consumption of Energy on Conversion to 1 kg. Ni, Kv. per Hr.
0.05	2.7	100.0	2.47
0.10	2.9	100.0	2.65
0.15	3.45	100.6	3.16
1.20	4.1	99.8	3.75
0.25	5.1	99.5	4.67
0.30	5.65	99.7	5.10

BYPRODUCTS FROM BRAZILIAN SALT

For each ton of crystallized salt produced from 30 deg. Be. brine, 76 kg. of gypsum can be precipitated. This is suitable for use in place of natural gypsum in a number of applications. On the basis of a 5 percent recovery, sufficient gypsum could be obtained to satisfy approximately the present Brazilian consumption of this mineral, which now amounts to some 40,000 tons. Such 30 deg. brines also contain other salts, as shown by the following approximate average composition:

	Grams per liter
Magnesium sulphate	85
Magnesium chloride	106
Sodium bromide	15
Potassium chloride	17
Sodium chloride	218

Some 12,800 liters of 30 deg. Be. mother liquor are required for the production of one ton of salt. Since the probable Brazilian production is about 700,000 tons annually, the residual mother liquors should contain, theoretically, the following quantities of salts:

	Tons per year
Magnesium sulphate	74,000
Magnesium choloride	96,000
Sodium bromide	14,000
Potassium chloride	15,000

Brazil is a large producer of salt for its own consumption and it could gain a great deal toward expanding its chemical industry by exploiting byproducts of the industry.

Digest from "The Salt Industry and the National Economy," by Mario da Silva Pinto. *Revista de Quimica Industrial* XI, No. 127, 13–15, 1942. (Published in Brazil.)

CHEMICAL ENGINEER'S BOOKSHELF

FOOD DEHYDRATION

DRYING AND DEHYDRATION OF FOODS. By Harry W. von Loesecke. Published by Reinhold Publishing Corp., 330 West 42nd St., New York, N. Y. 302 pages. Price $4.25.

Reviewed by F. K. Lawler

DOZENS of articles, papers and pamphlets have been published since Pearl Harbor on the war-inspired developments in food dehydration. But this is the first book on the subject and its greatest value lies in the fact that it brings together in one volume a fairly complete picture of food drying and dehydration as it stood when the book was written. Much is yet to be learned and new facts are being discovered continuously, so the volume cannot be taken as the final word.

The author discusses the engineering technology and cost phases of dehydration, as well as packaging, storage, compression, methods of analysis and reconstitution. He also gives a partial list of patents pertaining to the dehydration of foods. Among the engineering data are tables and charts useful in designing a dehydration installation.

To keep the book within reasonable limits of length, the discussion of each subject is brief—too brief in many instances for engineers and technologists in the commercial dehydration industry. Many references to other sources of information help, however, to broaden the scope of the treatment. All in all, the book would be profitable reading for anyone engaged in dehydration, although it might not answer his specific problems.

PRODUCTION AND APPLICATION

A COURSE IN POWDER METALLURGY. By Walter J. Baeza. Published by Reinhold Publishing Corp. New York, N. Y. 212 pages. Price $3.50.

Reviewed by Alexander Squire

THE APPARENT purpose of the author in writing this book was to introduce the technique and advantages of powder metallurgy to the engineering student. This object is, without doubt, accomplished, but it is doubtful if a student upon completion of the prescribed course would find himself in a position to enter the field of powder metallurgy with an adequate understanding of manufacturing conditions.

The entire background of metal powder production and application, including a good discussion of cohesion, is presented briefly in 85 pages, while the remaining 120 pages of text are devoted to a series of planned experiments designed to give the student a working knowledge of powder metallurgy. Although there is little mention of the unpredictable results obtained in powdered metal work without very careful control of many variables, a fitting tribute to the fickleness of the art is unconsciously paid by the inclusion, at the end of each experiment, of a series of curves which should be the result of the outlined work.

This little volume will be found useful as an elementary treatise by those who have recently become interested in this new field and desire general background information about its applications.

LIGHT-OIL STANDARDS

GAS CHEMISTS' BOOK OF STANDARDS FOR LIGHT OILS AND LIGHT OIL PRODUCTS. By V. J. Altieri. Published by American Gas Association, Inc., 420 Lexington Avenue, New York, N. Y. 352 pages. Price $3.50 to members, $5.00 to non-members.

THIS volume undertakes to present a summary of the standard specifications for, definitions of terms relating to, and standard methods of testing of a wide variety of the byproducts obtained during carbonization of coal or manufacture of water gas. The author has been assisted by a considerable number of his fellow members of the chemical committee of American Gas Association. The book is therefore an authoritative volume representing the best judgment of the industry which does the most work in production of benzene, toluene, xylenes, solvent naphthas, and other light oil products. Any laboratory which has any responsibility for sampling, testing, or industry control in which these commodities are involved, will find the volume a valuable and authoritative guide to laboratory practice. Purchasing agents will also find it of real usefulness.

BIOLOGICAL SCIENCES

DICTIONARY OF BIOCHEMISTRY AND RELATED SUBJECTS. Editor-in-Chief, William Marias Malisoff. Published by Philosophical Library, Inc., 15 East 40th St., New York, N. Y. 579 pages. Price $7.50.

Reviewed by Edward Lyons

THE Dictionary of Biochemistry is a combination alphabetical glossary of terms and authoritative discussion of many phases of biochemical subjects. In this respect it is a departure from the beaten path. Biological sciences are advancing rapidly and the printed word in textbook and in encyclopedia soon becomes obsolete.

In planning this book the Editor has tried to please everybody, for he states in his preface, "At least a dozen conflicting possibilities offered themselves . . . each of which was both enthusiastically supported and violently attacked by people with strong preferences and aversions." The result is a work in which the Editor "tries to maintain a balance between obsolescent, established and newly explored material." Some topics have been treated "too liberal," because information on the subjects covered is not easily available, whereas topics to be found in every text are treated rather briefly.

Forty-six collaborators present an array of specialists in their respective branches of the science. Their contributions lend authority to be respected. Some of the topics, which may run to 15 pages, include an extensive bibliography—something which will be appreciated by many workers in those particular fields.

Of the nearly 5,000 biochemical definitions, the following are some of the topics covered in detail. Amino acids (Van Slyke); Autolysis (Bradley); Bacteriophage (Krueger); Bioluminescence (Reiner); Carcinogenesis (Levy); Cellulose (Norman); Cardioactive glucosides (Jonnard); Estrogenic hormones (Teague); Photosynthesis (Emerson); Wound healing (Arey).

When one glances through the book the eye falls on some unfamiliar thoughts, which lead the reader to suspect that the Editor, in his zeal to give "first credit first," has cited references of little value to present day needs. Where a latest reference could have served best, one frequently sees a not easily accessible reference. To cite an example or two: Abelin Reaction for Arsphenamine; reference Munch. Med. Wochschr. 1910,1002. This publication is probably not accessible to many workers and a more recent reference would have given actual value. Incidentally, sodium nitrite and not the nitrate is used in the test. Likewise the Ber. *12*, 1390 reference to the Andreasch Iron Test could have been better replaced by a more recent reference to a thorough description of the test.

The Editor might have been a little more meticulous with some of his formulas and definitions. The statement that there are "50 known amino acids," that arsenoxide is "a compound formed by the oxidation of trivalent arsenic atoms," that sulfhydryl is "found in amino acids," that the adrenal gland "secretes a hormone regulating sex," that neo-arsphenamine is "Na 3-diamino-4 - dihydroxyarsenobenzene - methanal-sulfoxylate," that succinic acid is "ethylene-succinic (?) acid," etc. would lead a reader, not entirely familiar with these subjects, into error.

This reviewer has a strong dislike for synonyms which are not synonymous and for cross references which use up his time and energy.

Probably the severest criticism could be advanced against the Editor's apparent disregard for the value of tables in-

cluded in the book. While the stock used takes 8 or 10 pt. type very well the use of 4 and 6 pt. type on tables, etc. has made them rather trying on the eyes.

The Dictionary will no doubt be well received by many who have long felt the want of such a compilation.

FRONTIERS IN CHEMISTRY

THE CHEMISTRY OF LARGE MOLECULES. Edited by R. E. Burk and Oliver Grummitt. Published by Interscience Publishers, Inc., New York, N. Y. 313 pages. Price $3.50.

THE CHEMICAL BACKGROUND FOR ENGINE RESEARCH. Edited by R. E. Burk and Oliver Grummitt. Published by Interscience Publishers, Inc., New York, N. Y. 297 pages. Price $3.50.

Reviewed by F. C. Nachod

UNDER the auspices of Western Reserve University, Interscience Publishers has undertaken the highly commendable task of publishing a new series of textbooks entitled "Frontiers in Chemistry."

The first volume of their series, "The Chemistry of Large Molecules," contains the following contributions: The Mechanism of Polyreactions (Mark), The Investigation of High Polymers with X-Rays (Mark), The Colloidal Behavior of Organic Macromolecular Materials (Kraemer), The Ultracentrifuge and its Application to the Study of Organic Macromolecules (Kraemer), Elastic-Viscous Properties of Matter (Eyring et al.), The Electrical Properties of High Polymers (Fuoss), Organic Chemistry of Vinyl Polymers (Marvel), and Chemistry of Cellulose and Cellulose Derivatives (Ott). All of these papers give a well-rounded picture of the status of high polymer chemistry. They will not only enable those unfamiliar with the field to obtain rapidly a good cross-section knowledge but also will be helpful to the initiated.

The title of Volume II of the Series may be slightly misleading. It is the physico-chemical aspect of the field of fuel research which is in the foreground. The contributions of this volume are: A Survey of Combustion Research (Fiock), Chemical Thermodynamics of Hydrocarbons (Rossini), Synthetic Methods for Hydrocarbons (Whitmore), Kinetics of Flame and Combustion (von Elbe), The Experimental Side of Combustion Research in Engine (Lewis), and Physico-Chemical Aspects of Lubrication (Beeck). The titles of these papers which form the content of the book make it clear that the text really describes the "Thermodynamics and Kinetics of Fuels."

Binding, paper and appearance of the books, as is usual for Interscience, are excellent. At the end of each chapter in both books, the respective authors have included a bibliography.

Volumes III and IV which are forthcoming in the Series will have the respective titles, "Advances in Nuclear Chemistry and Theoretical Organic Chemistry" and "Major Instruments of Science and Their Applications to Chem-

istry." They promise to be interesting reading.

Editors, authors and publisher must be congratulated for the admirable job of filling a long-felt gap on the bookshelves of chemists who wish to be up-to-date on modern physico-chemical research and developments.

AUTHORITATIVE REFERENCE

ROGERS' MANUAL OF INDUSTRIAL CHEMISTRY. 6th Edition, Two Volumes. Edited by C. C. Furnas. Published by D. Van Nostrand Co., New York, N. Y. 1685 pages. Price, $17.

Reviewed by J. R. Callaham

ROGERS, Riegel and Read—these are the three R's in this country that now dominate and have dominated for some years the field of textbooks and general references on industrial chemistry. The first edition of Rogers' "Manual of Industrial Chemistry" was published in 1912; the sixth edition appeared just a few months ago. Riegel's "Industrial Chemistry" first appeared in 1928, and the fourth edition appeared late in 1942. The youngest of this trio, Read's "Industrial Chemistry," made its debut in 1933. The third edition of this latest work has been announced for this fall.

Before reviewing briefly the purpose and scope of these three books that dominate their field so completely, it is well to recall that there are two series of references on industrial chemistry that are considered as not belonging in the same category as the three R's, since they are specialized rather than general. The first is the venerable Thorpe's "Dictionary of Applied Chemistry," which is by far the most comprehensive work in the field. It has at times, however, the double disadvantages of being out-of-date on certain subjects and of reflecting British and continental practice more than American methods. In addition, there are the highly specialized Reinhold technological and monograph series, such as Hou's excellent "Manufacture of Soda" and Fairlie's "Sulphuric Acid Manufacture."

Read's "Industrial Chemistry" is intended primarily as an introductory textbook rather than as a reference work. And for this purpose it has some outstanding qualities; clarity of style, logical and well-developed presentation, lack of confusing detail, stress on well-known and basic processes. Those industries that are included are quite often well and comprehensively covered and for this reason the book has frequently been used as an elementary reference.

Riegel's "Industrial Chemistry," on the other hand, is designed to serve both as an introductory textbook and as an elementary reference. This book is full of illustrations and tables, and as a concise, cover-all, down-to-earth general reference work it probably has no superior in the English language. Its chief draw-back for that purpose is that its text material is highly condensed and sometimes very sketchy; its chief advantages are its surprisingly wide coverage and up-to-dateness.

Lastly, there is Rogers' "Manual of Industrial Chemistry," the sixth edition of which has been edited by Yale's C. C. Furnas in collaboration with a staff of 49 well-known authorities. This two-volume work is intended to serve as an intermediate textbook and as a general industrial reference. It is well suited for both purposes. Among its outstanding advantages are the detail on processes that the other two R's cannot afford to give, the careful editing, evaluation and coordination that is evident throughout the book, and finally, the important fact that each chapter has been written by an outstanding authority in the field.

Value of this Roger's book as an industrial reference is further increased by a number of other good and sound features: the large amount of data included in table, chart, diagram and flowsheet forms; liberal use of sideheads and cross-column heads; extensive references and well-selected supplemental reading list; custom of usually identifying important processes with plants using them; use of supplementary charts, such as that on petroleum byproducts and those on organic chemicals compiled by the late Alexander Lowy. The chief disadvantage that this reviewer has been able to find is the annoying absence of an index in Volume I.

In addition to an extensive and more logical rearrangement of the entire text material, a number of new chapters have been added to the present edition. These, in the main, represent industries that have increased greatly their industrial stature within the last decade. Among the new chapters are those on the economic pattern by Williams Haynes, unit operations by C. C. Furnas and A. E. Rogers, organic unit processes by J. A. Johnston, high-pressure processes by B. F. Dodge, natural salts and byproducts by R. B. MacMullin, industrial gases by W. H. Fulweiler, non-ferrous metallurgy by C. R. Hayward, surface coatings by G. G. Sward, industrial organic chemicals by the late Alexander Lowy, manufacture of intermediates and dyes by R. N. Shreve, industrial solvents by A. A. Backus and D. G. Zink, synthetic plastics by George Barsky, military gases by A. M. Prentiss, manufacture of pharmaceuticals by H. A. Shonle and cellulose industries by G. J. Esselen and M. H. Gurley, Jr.

As an experiment toward obtaining an objective basis of comparison for these three works, the accompanying table has been compiled. Such a table would have little value, in fact would be positively misleading unless all the works considered covered the same or comparable fields, were equally authoritative, and were comparable in regard to typography, paper stock and binding. The three R's here considered all live up to the same high standards in these respects. At first glance it appears that Rogers has a higher basic selling price than the other two books, but this difference is understandable when it is remembered that this is a two-volume work complied by some 50 different authorities, factors that tend to

increase greatly both editorial and production costs.

This reviewer feels that each of these commendable works fits best into its own particular niche. That they are excellently suited for their individual purposes is amply proved by the long and extensive usage as well as the frequent revisions that all three have undergone

Basic Comparison of Books on General Industrial Chemistry

	Rogers	Riegel	Read
Edition and year	6th (1942)	4th (1942)	2nd (1938)*
Publisher	Van Nostrand	Reinhold	Wiley
Publication price	\$17.00	\$5.50	\$5.00
Total number of text pages	1,685	844	579
Price per text page, cents	1.01	0.65	0.86
Approx. total number of illustrations	513	313	116
Illustrations per text page	0.30	0.37	0.20
Approx. total number of tables	299	176	49
Tables per text page	0.18	0.21	0.09
References	Extensive	Extensive	None
Student problems	None	Numerous	None
Typography, stock and binding	Excellent	Excellent	Excellent
Recommended purpose	Intermediate Textbook General Reference	Introductory Textbook Elementary Reference	Introductory Textbook

* The 3rd edition of this work is scheduled to appear in the fall of 1943.

GOVERNMENT PUBLICATIONS

The following recently issued documents are available at prices indicated from Superintendent of Documents, Government Printing Office, Washington, D. C. In ordering publications noted in this list always give complete title and the issuing office. Remittances should be made by postal money order, coupons, or check. Do not send postage stamps. All publications are in paper cover unless otherwise specified. When no price is indicated, pamphlet is free and should be ordered from Bureau responsible for its issue.

Contracts Termination Rules. War Department Procurement Regulation No. 15. Obtainable from War Department by companies having war contracts with that agency.

Regulations Relating to Overtime Wage Compensation. Opinions Manual No. 1, Department of Labor. This summarizes the interpretations which have been issued under Executive Order No. 9240, such as double time for the seventh day, holiday pay, absences, employment agreements, etc.

Structural and Heat-Transfer Properties of "Multiple Box-Girder Plywood Panels" for Walls, Floors, and Roofs. By Herbert L. Whittemore, Vincent B. Phelan, and Richard S. Dill, with the

collaboration of R. F. Luxford, Forest Products Laboratory. Bureau of Standards Building Materials and Structures Report BMS99. Price 15 cents.

Homogenous Fiber Wallboard. Recommended Commercial Standard. Bureau of Standards mimeographed release of August 5, 1943.

Woven Textile Fabrics—Testing and Reporting. Bureau of Standards Recommended Revision of Commercial Standard CS59-41. Mimeographed release of August 12, 1943.

Some Information From An Investigation on Methods of Confining Cardox Blasting Devices in Boreholes in Certain Coal Mines. By F. E. Griffith and C. H. Seeling. Bureau of Mines, Report of Investigations, R. I. 3714. Mimeographed.

Cooperative Fuel-Research Motor-Gasoline Survey, Winter 1942-43. By A. J. Kraemer and O. C. Blade. Bureau of Mines, Report of Investigations, R. I. 3716. Mimeographed.

Effect of Sulfur Content of Fuel on Composition of Exhaust Gas. By L. B. Berger, M. A. Elliott, and others. Bureau of Mines, Report of Investigations, R. I. 3713. Mimeographed.

Stenches for Emergency Warnings in Metal Mines. By D. Harrington and J. H. East, Jr. Bureau of Mines, Information Circular, I. C. 7246. Mimeographed.

Foreign-Trade and Exchange Controls in Germany. By L. A. Morrison, Ernest Wolff, and others. Tariff Commission Report No. 150, Second Series. Price 35 cents.

Bag-Molding of Plywood. By Bruce G. Heebink. Forest Products Laboratory. Mimeograph No. R1431.

The Effect of Fire-Retardant Chemicals on Glues Used in Plywood Manufacture. By John Merle Black. Forest Products Laboratory. Mimeograph No. R1427.

Notes on the Manufacture of Flat Plywood. Revised April 1943. Forest Products Laboratory. Mimeograph No. R543.

Preliminary Experiments to Improve the Gluing Characteristics of Refractory Plywood Surfaces by Sanding. By F. H. Kaufert. Forest Products Laboratory. Mimeograph No. 1351.

A Procedure for Measuring the Mold Resistance of Protein Glues. By F. H. Kaufert and C. Audrey Richards. Forest Products Laboratory. Mimeograph No. 1344.

Sugar-Beet Blocking by Machinery. By S. W. McBirney. U. S. Department of Agriculture Farmers' Bulletin No. 1933. Price 5 cents.

Sugar-Beet Seed Production in Southern Utah, with Special Reference to Factors Affecting Yield and Reproductive Development. By Bion Tolman. U. S. Department of Agriculture Technical Bulletin No. 845. Price 10 cents.

Soybean Diseases and Their Control. By Howard W. Johnson, and Benjamin Koehler. U. S. Department of Agriculture Farmers' Bulletin No. 1937.

Physical Properties of Terrazzo Aggregates. By Daniel W. Kessler, Arthur Hockman, and Ross E. Anderson. Bureau of Standards Building Materials and Structures Report BMS98. Price 15 cents.

Cotton Production and Distribution, Season of 1941-42. Department of Commerce, Bureau of the Census Bulletin 179. Price 10 cents.

Mineral Production Statistics for 1942—Preliminary mimeographed statements from Bureau of Mines on: Barite and Barium Chemicals, M. M. S. No. 1088; Coke and Byproducts, M. M. S. No. 1092; Iron Ore, M. M. S. No. 1093; Gem Stones, M. M. S. No. 1095; Phosphate Rock, M. M. S. No. 1096; Pig Iron, M. M. S. No. 1097; Talc, Pyrophyllite, and Ground Soapstone, M. M. S. No. 1098; Ferrous Scrap and Pig Iron, M. M. S. No. 1100; Transactions of Nonferrous Scrap Dealers, M. M. S. No. 1102; Portland Cement, M. M. S. No. 1103; Special Portland Cements, M. M. S. No. 1104.

Paint Specifications. Extended revisions and amendments have been made of the government paint purchasing specifications. Those using older editions should request amendments and new editions for all types of pigment, paint, enamel, lacquers and drying oils to take account of these changes.

Cleanser Specifications. Numerous amendments to soap, cleanser, polish and detergent specifications have been issued and should be requested by companies interested in the Federal Stock Catalog requirements for these commodities.

RECENT BOOKS and PAMPHLETS

Directory of War Agencies. Issued by War Service Division, Chamber of Commerce of U. S., Washington, D. C. Price 25 cents. Directory giving names and addresses of Federal agencies participating in the war programs including the names of some of the principal officials in each.

Conventions: Planning, Promoting, Managing. Published by Trade Association Department, Chamber of Commerce of U. S., Washington, D. C. Free to trade association officers and executives. A mimeographed resume of trade association practice.

Heat Transfer Bibliography. By F. D. Vilbrandt and others. Engineering Experiment Station Series No. 53, published by Virginia Polytechnic Institute, Blacksburg, Va. 72 pages. Price 25 cents. Literature references through 1942.

Industrial Radiology. Second Edition. By A. St. John and H. R. Isenburger. Published by John Wiley & Son, New York, N. Y. 298 pages. Price, $4. Industrial production and use of X-rays.

90 Years of Industrial Pioneering. Published by Swan-Finch Oil Corp., New York, N. Y. 36 pages. A history of the corporation, specialists in lubricants and core oils.

The Use of the Spekker Photo-Electric Absorptiometer in Metallurgical Analysis. Further Advances in the use of the Spekker Photo-Electric Absorptiometer in Metallurgical Analysis. By E. J. Vaughan. Published by Institute of Chemistry of Great Britain and Ireland. 48 and 51 pages. Available from Jarrell-Ash Co., 165 Newbury St., Boston, Mass. Price of two booklets, $1.

Company Museums. By L. V. Coleman. Published by American Association of Museums, Washington, D. C. 153 pages. Price $2.50. Purpose of this book for business men is to show the nature and usefulness of company museums used for business reference and public relations. They are devoted to history and to technical matters.

Patents and Industrial Progress. By George E. Folk. Published by Harper & Bros., New York, N. Y. 393 pages. Price $3. Analyzes recommendations for patent legislation made by Thurmon Arnold. Discusses differences between cartels and legal patent licensing agreements.

Food for Thought. By H. F. Willkie and C. J. Kolachov. Published by Indiana Farm Bureau, Inc., Indianapolis, Ind. 209 pages. Power alcohol and technical aspects of ethyl alcohol as a motor fuel.

Distillers' Grain Manual. Compiled by R. T. Willkie and R. S. Mather. Published by Joseph E. Seagram & Son, Inc., Louisville, Ky. 53 pages. Origin, botany and classification of grains; grains from farms to terminal market; handling of grain at the distillery; meal; grain by-products.

The Springs of Sao Lorenco. By *J. F. de Andrade.* Published by the Department of Agriculture, Rio de Janeiro, Brazil. 40 pages. Describes the mineral springs and the installations of the Brazilian Department of Agriculture.

Syllabus of Clay Testing, Part I. By *C. A. Klinefelter* and others. Bureau of Mines Bulletin 451, available from Superintendent of Documents, Washington, D. C. 35 pages. Price 15 cents. A series of tests in which the main and final classification is on the basis of use.

Pressure Losses Registers and Stackheads in Forced Warm-Air Heating. By *A. P. Kratz* and *S. Konzo.* Engineering Experiment Station Bulletin 342. Published by the University of Illinois, Urbana, Ill. 58 pages. Price 65 cents. Results of an extensive series of tests.

War Plant Employee Transportation. Published jointly by the National Conservation Bureau and the National Association of Manufacturers, 14 W. 49th St., New York, N. Y. 8 pages. Booklet No. 1, "The Problem." Subsequent booklets will deal with such subjects as Group Riding, Transit Improvements, Staggered Hours, etc.

MANUFACTURERS' LATEST PUBLICATIONS

Publications listed here are available from the manufacturers themselves, without cost unless a price is specifically mentioned. To limit the circulation of their literature to responsible engineers, production men and executives, manufacturers usually specify that requests be made on business letterhead.

Copper and Brass. Copper & Brass Research Association, 40 Lexington Ave., New York, N. Y.—Bulletin 125—36-page special issue of this organization's bulletin featuring the importance of copper and brass in various aspects of the war effort. Discusses briefly mining of copper, fabrication, brass mills; foundry equipment, Navy equipment and copper in the construction of planes, cartridges and shells, railroads, etc. Extensively illustrated.

Mortars. The Ironton Fire Brick Co., Iron, Ohio.—Four-page form discussing briefly and illustrating the applications of this concern's "Alset" high-temperature mortar for boiler settings, incinerators, lime kilns, ceramic kilns, etc.

Laboratory Ovens. The Emil Greiner Co., 161 Sixth Ave., New York, N. Y.—24-page catalog dealing with this concern's line of automatically controlled electric heating ovens, baths, incubators, air sterilizers, conditioner cabinets, etc. Each unit is illustrated and described briefly, with specification data. Contains price lists.

Metal Reclamation. Hardinge Co., York, Pa.—Bulletin 8-A—12-page booklet dealing with reclamation of foundry waste, recovery of brass from foundry waste, recovery of aluminum, magnesium and zinc from dross and skimmings, etc. Also discusses this concern's conical ball mill thickeners, clarifiers and other equipment. Well illustrated.

Pumps. De Laval Steam Turbine Co., Trenton, N. J.—Leaflet E-1179—Eight-page booklet describing briefly problems in pumping station economics and the planning and development of Cleveland's three great pumping stations equipped with geared turbine-driven centrifugal pumps. Illustrated.

Pipe Fittings. Air Reduction Co., 60 E. 42nd St., New York, N. Y.—12-page booklet entitled "Pipe Templates for Welded Fittings," which tells how to fabricate fittings for welded piping installations by means of flame-cutting and welding. Intended primarily for use where special fittings are required. Well illustrated with photographic reproductions and diagrammatic drawings.

Water Heaters. American District Steam Co., North Tonawanda, N. Y.—Bulletin 3575C—Six-page bulletin dealing with this concern's line of "Adsco" water heaters of the horizontal and vertical type with U-tube heating elements. Contains extensive engineering data and diagrammatic drawings.

Welding Positioner. Ransome Machinery Co., Dunellen, N. J.—Bulletin 196—Two-page form illustrating and describing the 2,500-lb. capacity hand-operated welding positioner just released by this concern. Contains data on capacities and dimensions.

Automatic Control. Askania Regulator Co., 1603 S. Michigan Ave., Chicago, Ill.—Bulletin 116—15-page booklet describing this concern's line of automatic control equipment for soaking pit furnaces. Describes problems involved in soaking pit operation, importance of correct temperature conditions, length of soaking period, effect of furnace atmosphere on scale control, etc. Gives typical diagrams showing applications of control equipment in soaking pit furnaces. Includes a chart showing properties of typical steel mill

gases. Extensively illustrated with diagrammatic drawings and charts.

Electric Brakes. Empire Electric Brake Co., South 14th St., Newark, N. J.—Six-page folder which describes this concern's "Magdraulic Electric Brake." Explains construction and operation, and gives engineering drawings with dimensions. Includes typical wire diagrams. Illustrated.

Liquid Proportioning. D. W. Haering & Co., Inc., 205 W. Wacker Drive, Chicago, Ill.—Eight-page bulletin describing latest developments in this concern's proportioning and sampling equipment. Includes data on construction, operation and application, together wih dimensions, includes typical wiring diagrams. Illustrated with photographic reproductions and diagrammatic drawings.

Fire Fighting. Walter Kidde & Co., Inc., 140 Cedar St., New York 6, N. Y.—15-page booklet entitled "How to Teach Fire Fighting." Discusses methods of handling demonstration, the demonstration itself, various techniques with different types of extinguishers, etc. Very well organized and easy to understand. Illustrated by diagrammatic sketches.

Coke Oven Plants. Koppers Co., Engineering & Construction Div., Koppers Bldg., Pittsburgh, Pa.—12-page leaflet entitled "Coke Oven Plant Construction and Development in 1942." Summarizes recent developments in coke oven construction, electrical precipitators, number of plants and batteries put into operation, technical advances, etc. Well illustrated with photographic reproductions and sketches.

Whiteprints. Ozalid Products Div., General Aniline & Film Co., Johnson City, N. Y.—Four-page form illustrating use of "Ozalid" whiteprints for shop and industrial uses. Also describes this concern's dry developing process and line of new sensitized materials.

Air Cleaning. Logan Engineering Co., 4900 Lawrence Ave., Chicago, Ill.—Bulletin 543—Eight-page bulletin which describes briefly and illustrates applications of this concern's "Aridifier" for cleaning and drying compressed air by centrifugal force. Contains specification data and a list of industrial applications.

Cutting Oils. The Sharples Corp., 2323 Westmoreland St., Philadelphia, Pa.—Bulletin No. 1228—Twelve-page bulletin dealing with the purification of cutting oils. Points out why cutting oil purification is necessary, how the Sharples super-centrifuge works, machine tool sumps, purification of honing and grinding oils, etc. Well illustrated.

Measuring Gloss. American Instrument Co., Silver Spring, Md.—Bulletin 2115—Four-page form which announces this concern's "Glossmeter" for measuring gloss from zero to a hundred percent of any plain surface at any angle between zero and 70 deg. Describes the unit, its outstanding features, applications and accessories. Illustrated.

Tool Steels. Cooperweld Steel Co., Warren, Ohio—Publication 691W — 48-page handbook on the "Coppo" tool steels put out by this concern. Gives descriptions, working suggestions and demonstration photographs, and includes a chart listing more than 70 common tool applications and recommendations for selection. Also contains useful tables. Sturdily bound.

Organic Chemicals. Paragon Testing Laboratories, Orange, N. J.—List 4—24-page catalog giving this concern's revised listing of its line of fine organic chemicals. Includes price on each chemical.

Waxes. Distributing and Trading Co., 444 Madison Ave., New York, N. Y.—Four-page market bulletin listing this concern's line of imported and domestic waxes. Briefly lists specifications and prices in various quantities. Includes data on various grades of ozokerite, carnauba wax, candelilla, etc.

Leather Belting Conservation. Baldwin Belting & Leather Co., Inc., 85 Chambers St., New York, N. Y.—Booklet E—20-page booklet which contains useful engineering data on the proper selection, installation and maintenance of leather belts, methods for aligning shafting and pulleys, cleaning and dressing leather belts, belt speed and recommended pulley diameter tables, belting formulas and specifications. Contains numerous tables of engineering data.

ECONOMICS AND MARKETS

INDUSTRIAL CONSUMPTION OF CHEMICALS IS BUT LITTLE AFFECTED BY SEASONAL INFLUENCES

DESPITE THE handicap of shortage of trained operators and periods of overhauling overworked equipment, production of chemicals continues to forge ahead to new records with new plant capacities contributing to this result. The volume of chemicals which is passing into regular industrial channels of consumption likewise is maintained on a high level and a review of the past three months reveals that operations have been well standardized with the customary seasonal influences felt only in a few instances. This has gone on long enough to demonstrate that the large chemical-consuming industries are largely engaged in war work and are not greatly affected by restrictions which have cut down outputs in many civilian lines of manufacture. Yet textile plants cut down activities in the last two months and a rather sharp drop in production of superphosphate was reported for July.

It is probable that this type of chemical consumption—even though part of it is not tied up with the war effort—will be further stabilized in the near future as a tentative program for the production of essential consumer goods necessary for the efficient functioning of the civilian economy has been presented to the War Production Board. The Office of Civilian Requirements has taken a firm stand to insure that the minimum requirements for the civilian population will be met to preserve working efficiency of the labor force and to provide for the needs of families in the rapidly growing war communities. Consideration is also being given to securing an adequate supply of repair parts and an equitable distribution of the available supply of civilian goods. While this program gives considerable attention to the wants of the individual, it also is mindful of industry.

The Federal Reserve Board reports that industrial operations in July reached a new peak after having met a slight set-back in June. The *Chem. & Met.* index for consumption of chemicals for July fell a little under the revised index for June but the fluctuation in the last three months has not been large and preliminary figures for August indicate that the hot weather months have not changed production schedules. The index for July is 172.30 and the revised figure for June is 177.35. In July there was some recession in activities at textile mills, at paper and pulp plants, and in the paint and varnish trade. However, higher operating rates have been in evidence at petroleum refineries and at steel mills. Last year the index for consumption of chemicals was 164.14 for July and 166.56 for June.

A study of the end uses of chemicals brings up some doubts regarding a continuous supply for many consuming lines and might offer some contradiction to the belief that the large chemical-consuming industries will continue on a fairly even keel. For instance, the supply of sulphuric acid has been brought to a low level with some consumers anxious about future deliveries and it is generally conceded that some new capacity must be provided in specified areas. In the meantime, plans are being worked out to make spent acid from munitions plants available for fertilizer and other use.

The shortage of oils and fats is not now so pressing. It has been announced that the crushing capacity of the country is sufficient to take care of all domestic oil-bearing materials plus whatever imports may come into the country. For crushing soybeans, we have a capacity for 150,000,000 bushels in the central producing states and in California, Maryland, New Jersey, and Pennsylvania. This does not include more than 100,000,000 bushels capacity which exists at southern cotton oil mills. Furthermore, mills now under construction and the addition of new equipment to existing plants is expected to add 21,000,000 bushels to the soybean capacity —much of this being in Iowa.

Chem. & Met. Index for Industrial Consumption of Chemicals

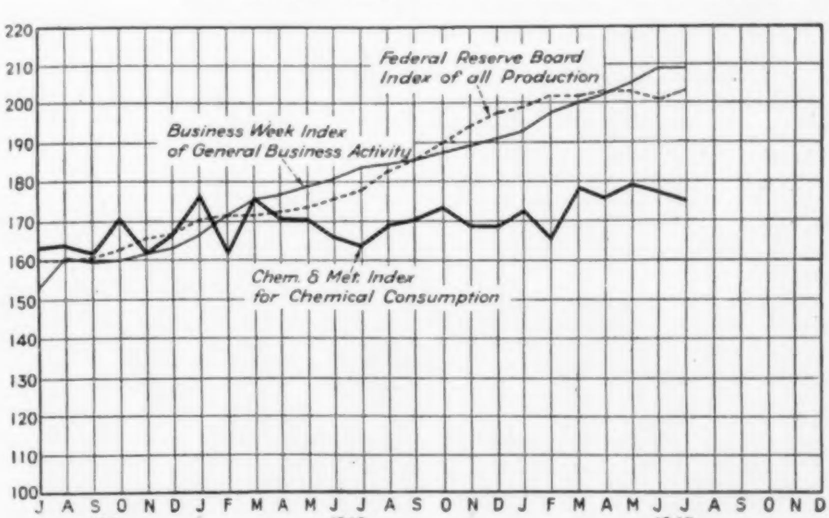
	June revised	July
Fertilizers	39.95	36.50
Pulp and Paper	18.80	18.33
Petroleum refining	15.12	15.84
Glass	18.95	18.74
Paint and varnish	18.00	17.00
Iron and steel	13.14	13.51
Rayon	15.17	15.00
Textiles	11.57	10.74
Coal products	8.97	9.10
Leather	4.55	4.40
Industrial explosives	5.38	5.34
Rubber	3.00	3.00
Plastics	4.75	4.80
	177.35	172.30

Linseed crushing capacity is placed at 34,000,000 bushels in Minnesota, Kansas, and the Great Lake ports; 16,000,000 bushels on the eastern seaboard in Maryland, New Jersey, eastern New York, and Pennsylvania; 11,000,000 bushels in California and Oregon. This makes a total of 61,000,000 bushels and does not include two linseed mills with a capacity of 11,000,000 bushels which have been converted to handle soybeans.

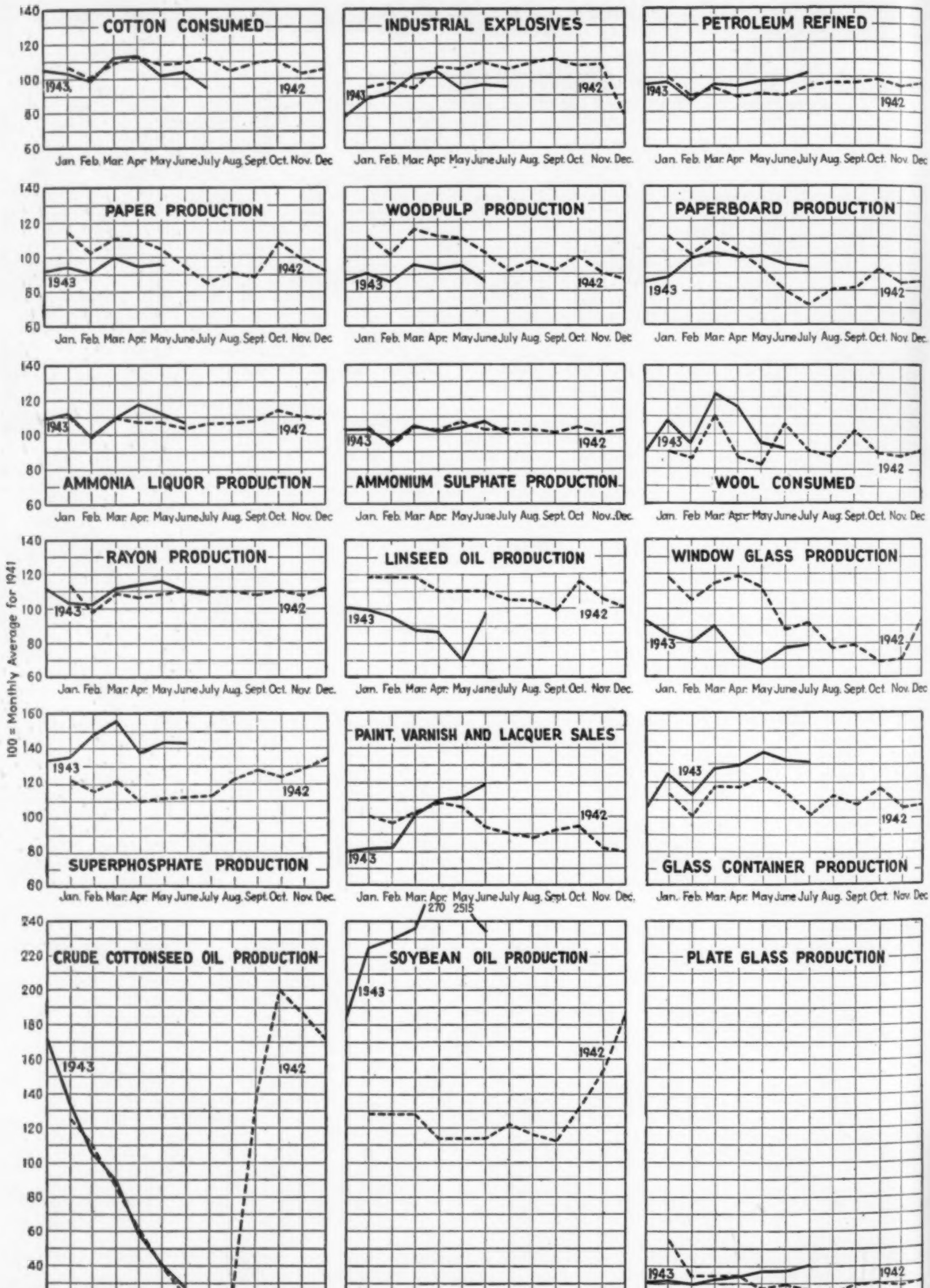
The cotton oil mills have a capacity of 11,500,000 tons of seed of which about 4,500,000 tons will be required to crush the present cottonseed crop.

The importance of synthetic rubber production has been greatly increased in the past month with new plants coming into production and with a consequent broadening in the output of chemicals and their fabrication. This new industry is so essentially chemical that it can not fail to have a material influence on chemical activity in general. A WPB report on the progress of the synthetic rubber program stated that only 3 percent was finished a year ago last June, 15 percent in place at the beginning of this year, and 61 percent completed by the end of June and the June figure was materially increased by the end of August.

This report further stated that the largest percentage gain for the first half of this year in the war facilities program was registered for plants to produce 100-octane gasoline. At the beginning of the year less than 1 percent of the government-financed program had been met but by July 1 it had been about 39 percent completed with the expectation that steady increases would follow in the remaining months of the year. The privately financed program had been about 63 percent completed by July 1.



Production and Consumption Trends



OUTPUT OF CHEMICALS REMAINS HIGH BUT MAY BE SLOWED UP BY LACK OF SKILLED WORKERS

Despite many difficulties connected with production and distribution, the output of chemicals has kept at record levels and in most cases the movement from producing plants is large enough to prevent any stock accumulations. Of late there has been a growing threat to production through the loss of skilled workers with very little chance for suitable replacements. One branch of the industry reported to the War Production Board late last month that it was faced with a high labor turnover with loss of workers to other war industries and that this was typical of all branches of the chemical industry. Speaking specifically of plastics, it was stated that some of the largest plants have been barely able to maintain production schedules as a result of loss of workers. Some plants must reduce operations in the near future unless there is a change in the labor situation.

Interest in the spot market has not been keen as the bulk of consumer requirements are being filled by contract deliveries and export inquiry has been somewhat slowed up by a reduction in the number of permits granted. In some cases it is stated that some of the South American countries have suggested the commodities which they wished to have imported into their markets. In a few instances the spot supply of chemicals has been reduced by requests from the government that producers accumulate stockpiles as in the case of caustic soda. The supply of alcohol in reserve is now reported as above 140,000,000 gal. but none of this is available in the present market. It is also pointed out that stocks of glycerine and phthalic anhydride are relatively large but these stocks are being held as a safeguard in case requirements for the war program should suddenly be accentuated.

Over a long period, there has been considerable change in the availability of a long list of chemicals. Chlorine was one of the first to find a market larger than it could take care of. But it no longer is on the critical list and because of the increase in supply the Petroleum Administration last month removed chlorine from restrictions placed on the use of additives in the manufacture of extreme pressure lubricants. Sulphuric acid which had been in ample supply has been growing scarce in certain sections and with overall consumption increasing, some new sources of supply must be found. Dry ice is another chemical which has recently been reported scarce in some of the large shipping centers in the midwest. Incidentally new carbon gas resources are reported to have been uncovered in northern California and new production of dry ice already has begun in that sector.

Consumers of wool grease have found trouble in recent weeks in securing enough of that material to satisfy their demands and starting the first of this month, this material was placed under allocation. Last month the allocation order restricting purchases of acetic anhydride was revised to apply to acetic acid and acetaldehyde. At the same time it was announced that production of acetic acid this year would fall far short of requirements with a still larger deficiency next year unless some expansion program, not yet apparent, should come into being. The ordinary type of ethyl alcohol used in industry also was placed under allocation to take effect Oct. 1. This step was taken not as a restrictive measure but in order to have greater latitude in making allocations on a quarterly basis according as the supply increased in volume. On the other hand, the order restricting the use of nutgalls and tannic acid was revoked partly because of increased supplies and partly because the principal use for which tannic acid had been reserved is no longer considered important.

One of the most important developments in the market is found in the report that some of the alcohol plants on the eastern seaboard were being reconverted to handle blackstrap molasses. This step, followed arrangements which will bring in large amounts of molasses from Cuba and Puerto Rico. The extent of this move seems to rest with the shipping tonnage which will be made available. In this connection studies have been made regarding the advisability of importing molasses of high sugar content to cut down shipping space and to ship the molasses as dry cargo. There is no doubt regarding the amount of molasses which can be supplied by the outside countries and if tankers are turned over for this purpose the price structure in the market will be affected by the lower cost raw material.

While the synthetic rubber program has been largely responsible for the sharp rise in demand for alcohol, the anti-freeze trade is of considerable importance and it is now made known that 45,000,000 gal. of ethyl alcohol have been allocated for this trade for the coming season. In addition, permanent type anti-freeze chemicals will be permitted in 12 high-altitude states.

The market has shown a steady price position with fluctuations practically re-

CHEM. & MET.
Weighted Index of Prices for
CHEMICALS

Base=100 for 1937

This month	**109.0**
Last month	109.6
September, 1942	109.3
September, 1941	103.4

Prices are largely pegged but official permission was given to raise quotations on iron-free sulphate of aluminum because of higher production costs. Spirits of turpentine, which are without control, sold at a slight advance.

stricted to the commodities which were revised with official permission. Most important was the sanction given to advance sales prices for iron-free aluminum sulphate to the extent of one-half cent a lb. This chemical is important in the war effort and the former price level did not permit a profit margin for producers. Denatured edible lard to be used in making soap has been given maximum ceilings which will be the same as those for edible lard which is not denatured. The soap-making material is to be denatured so that it may be shipped across state lines without violating meat inspection regulations.

Demand for corn starch is active and for the first time in three months an increase in the corn grind was reported, the July grind having reached a total of 9,198,363 bushels or a gain of 462,392 bushels over the June figure. The output, however, was below the rate maintained a year ago and with distribution on a preference basis some consumers are still receiving only a part of their usual allotments.

That cooperation between producers and government agencies can help in improving the supply situation of scarce materials is cited in the case of producers of sulphonated oils who have been working with the War Food Administration in a study on the interchangeability of oils in essential end uses. The purpose of the study was to compile a list of end uses where one sulphonated oil may be substituted for another and also to list cases where substitutions can not be made. With fairly regular arrivals of castor beans from Brazil, the supply of castor oil has improved in volume and as red oil is in limited supply it is suggested that users turn to the more available product where this substitution can be made.

Allocations of edible fats and oils for the second quarter of the fiscal year are expected to reflect the change in attitude within the Fats and Oils Division of the War Food Administration. When the orders were first set up governing uses of fats and oils, the trend was away from industrial uses toward the edible side. This policy evidently was established without due regard to the amount of edible fats and oils that are normally absorbed by industrial users.

It is now apparent that the pendulum is swinging the other way, and the new trend will be even more noticeable in the second quarter allocations of edible fats and oils due to be announced shortly.

CHEM. & MET.
Weighted Index of Prices for OILS & FATS

Base = 100 for 1937

This month	145.55
Last month	145.55
September, 1942	141.01
September, 1941	127.37

Limited supplies of most selections have freed the market from competitive selling and ceiling prices are generally observed with no price variation during the month.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ARMSTRONG CORK COMPANY
Insulation Headquarters

CURRENT PRICES

INDUSTRIAL CHEMICALS

	Current Price	Last Month	Last Year
etone, drums, lb	$0.085–$0.109	$0.085–$0.109	$0.168–$0.173
id, acetic, 28%, bbl., cwt	3.38 – 3.63	3.38 – 3.63	3.38 – 3.63
Glacial 99.5%, drums	9.15 – 9.40	9.15 – 9.40	9.15 – 9.40
U. S. P. X 1, 99.5%, dr	10.95 –11.20	0.95 –11.20	10.95 –11.20
Boric, bbl., ton	109.00–113.00	109.00–113.00	109.00–113.00
Citric, kegs, lb	.20 – .23	.20 – .23	.20 – .23
Formic, cbys, lb	.10½– .11	.10½– .11	.10½– .11
Gallic, tech., bbl., lb	1.10 – 1.15	1.10 – 1.15	1.10 – 1.15
Hydrofluoric 30% drums, lb	.08 – .08½	.08 – .08½	.08 – .08½
Lactic, 44%, tech., light, bbl., lb	.073– .075	.073– .075	.073– .075
Muriatic 18°, tanks, cwt	1.05 –......	1.05 –......	1.05 –......
Nitric, 36°, carboys, lb	.05 – .05½	.05 – .05½	.05 – .05½
Oleum, tanks, wks., ton	18.50 –20.00	18.50 –20.00	18.50 –20.00
Oxalic, crystals, bbl., lb	.11¼– .13	.11¼– .13	.11¼– .13
Phosphoric, tech., c'bys., lb	.07½– .08½	.07½– .08½	.07½– .08½
Sulphuric, 60°, tanks, ton	13.00 –......	13.00 –......	13.00 –......
Sulphuric, 66°, tanks, ton	16.50 –......	16.50 –......	16.50 –......
Tannic, tech., bbl., lb	.71 – .73	.71 – .73	.71 – .73
Tartaric, powd., bbl., lb	.70 –......	.70 –......	.70 –......
Tungstic, bbl., lb	nom	nom	nom
lcohol, amyl	–	–	–
From Pentane, tanks, lb	.131–......	.131–......	.131–......
lcohol, Butyl, tanks, lb	.10½– .18½	.10½– .19	.158–......
lcohol, Ethyl, 190 p'f., bbl., gal	11.94 –......	11.94 –......	8.19 – 8.25
Denatured, 190 proof	–	–	–
No. 1 special, dr., gal. wks	.62 –......	.62 –......	.60 –......
lum, ammonia, lump, bbl., lb	.03¾– .04	.03¾– .04	.03¾– .04
Potash, lump, bbl., lb	.04¼– .04½	.04¼– .04½	.04 – .04½
luminum sulphate, com. bags, cwt	1.15 – 1.40	1.15 – 1.40	1.15 – 1.40
Iron free, bg., cwt	2.35 – 2.50	1.85 – 2.10	1.85 – 2.10
qua ammonia, 26°, drums, lb	.02¾– .03	.02¾– .03	.02¾– .03
tanks, lb	.02 – .02½	.02 – .02½	.02 – .02½
mmonia, anhydrous, cyl., lb	.16 –......	.16 –......	.16 –......
tanks, lb	.04½–......	.04½–......	.04½–......
mmonium carbonate, powd. tech., casks, lb	.09½– .12	.09½– .12	.09½– .12
Sulphate, wks., ton	29.20 –......	29.20 –......	29.00 –......
mylacetate tech., from pentane, tanks, lb	.145–......	.145–......	.145–......
ntimony Oxide, bbl., lb	.15 –......	.15 –......	.15 –......
rsenic, white, powd., bbl., lb	.04 – .04½	.04 – .04½	.04 – .04½
Red, powd., kegs, lb	nom	nom	nom
arium carbonate, bbl., ton	60.00 –65.00	60.00 –65.00	60.00 –65.00
Chloride, bbl., ton	79.00 –81.00	79.00 –81.00	79.00 –81.00
Nitrate, casks, lb	.11 – .12	.11 – .12	.10½– .11
lanc fix, dry, bbl., lb	.03½– .04	.03½– .04	.03½– .04
leaching powder, f.o.b., wks., drums, cwt	2.25 – 2.35	2.25 – 2.35	2.25 – 2.35
orax, gran., bags, ton	44.00 –......	44.00 –......	44.00 –......
romine, cs., lb	.30 – .32	.30 – .32	.30 – .32
alcium acetate, bags	3.00 –......	3.00 –......	3.00 –......
Arsenate, dr., lb	.07 – .08	.07 – .08	.07 – .08
Carbide drums, lb	.04½– .05	.04½– .05	.04½– .05
Chloride, fused, dr., del., ton	18.00 –24.00	18.00 –24.00	18.00 –24.00
flake, bags., del., ton	18.50 –25.00	18.50 –25.00	18.50 –25.00
Phosphate, bbl., lb	.07½– .08	.07½– .08	.07½– .08
arbon bisulphide, drums, lb	.05½–......	.05½	.05½–......
Tetrachloride drums, gal	.73 – .80	.73 – .80	.73 – .80
hlorine, liquid, tanks, wks., 100 lb.	2.00 –......	2.00 –......	2.00 –......
Cylinders	.05¼– .06	.05¼– .06	.05¼– .06
obalt oxide, cans, lb	1.84 – 1.87	1.84 – 1.87	1.84 – 1.87
opperas, bgs., f.o.b., wks., ton	18.00 –19.00	18.00 –19.00	18.00 –19.00
opper carbonate, bbl., lb	.19½– .20	.19½– .20	.18 – .20
Sulphate, bbl., cwt	5.00 – 5.50	5.00 – 5.50	5.15 – 5.40
ream of tartar, bbl., lb	.57 –......	.57 –......	.57 –......
iethylene glycol, dr., lb	.14 – .15½	.14 – .15½	.14 – .15½
psom salt, dom., tech., bbl., cwt.	1.90 – 2.00	1.90 – 2.00	1.90 – 2.00
thyl acetate, drums, lb	.12½–......	.12½–......	.12 –......
ormaldehyde, 40%, bbl., lb	.05½– .06	.05½– .06½	.05½– .06
urfural, tanks, lb	.09 –......	.09 –......	.09 –......
usel oil, drums, lb	.18 – .19	.18 – .19	.18 – .19
laubers salt, bags, cwt	1.05 – 1.10	1.05 – 1.10	1.05 – 1.10
lycerine, c.p., drums, extra, lb	.18½–......	.18½–......	.18½–......

The accompanying prices refer to round lots in the New York market. Where it is the trade custom to sell f.o.b. works, quotations are given on that basis and are so designated. Prices are corrected to September 12

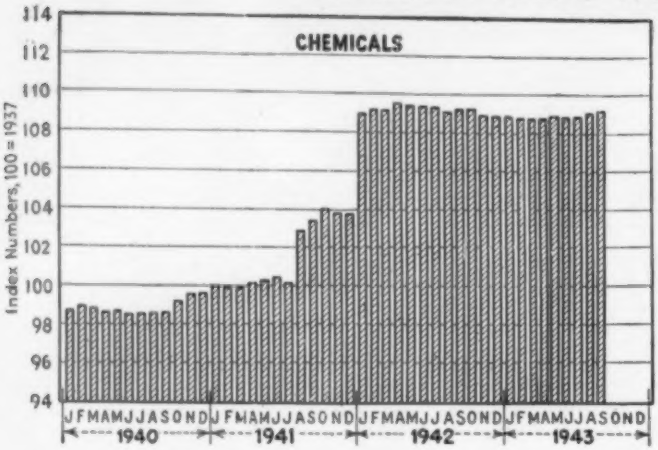
INDUSTRIAL CHEMICALS

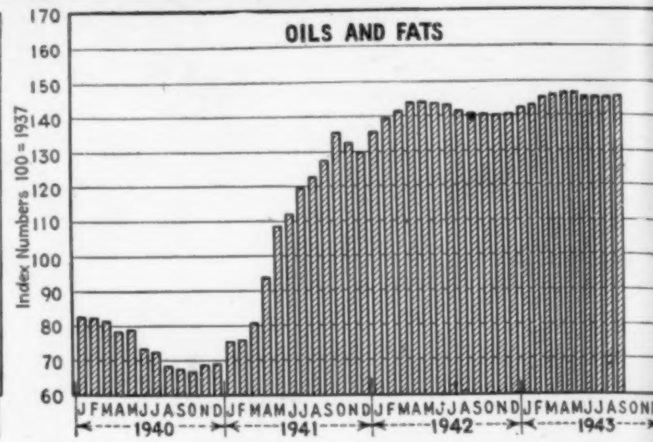
	Current Price	Last Month	Last Year
Lead:			
White, basic carbonate, dry casks, lb	.08¼–......	.08¼–......	.08¼–......
White, basic sulphate, sck., lb	.07¾–......	.07¾–......	.07¾–......
Red, dry, sck., lb	.09¼–	.09¼–......	.09¼–......
Lead acetate, white crys., bbl., lb.	.12½– .13	.12½– .13	.12½– .13
Lead arsenate, powd., bag, lb	.11½– .12	.11½– .12	.11 – .12
Lime, chem., bulk, ton	8.50 –......	8.50 –......	8.50 –......
Litharge, powd., csk., lb	.08¼–......	.08¼–......	.08¼–......
Lithopone, bags, lb	.04¼– .04½	.04¼– .04½	.04¼– .04½
Magnesium carb., tech., bags, lb	.06¼– .06½	.06¼– .06½	.06¼– .06½
Methanol, 95%, tanks, gal	.58 –......	.58 –......	.60 –......
97%, tanks, gal	.58 –......	.58 –......	.60 –......
Synthetic, tanks, gal	.28 –......	.28 –......	.28 –......
Nickel salt, double, bbl., lb	.13½– .13½	.13½– .13½	.13½– .13½
Orange mineral, csk., lb	.12½–......	.12½–......	.12½–......
Phosphorus, red, cases, lb	.40 – .42	.40 – .42	.40 – .42
Yellow, cases, lb	.18 – .25	.18 – .25	.18 – .25
Potassium bichromate, casks, lb	.09½– .10	.09½– .10	.09½– .10
Carbonate, 80–85%, calc. csk., lb.	.06¼– .07	.06¼– .07	.06¼– .07
Chlorate, powd., lb	.10 – .12	.10 – .12	.10 – .12
Hydroxide (c'stic potash) dr., lb.	.07 – .07½	.07 – .07½	.07 – .07½
Muriate, 60% bags, unit	.53½–......	.53½–......	.53½–......
Nitrate, bbl., lb	.05½– .06	.05½– .06	.05½– .06
Permanganate, drums, lb	.19½– .20	.19½– .20	.19½– .20
Prussiate, yellow, casks, lb	.17 – .18	.17 – .18	.17 – .18
Sal ammoniac, white, casks, lb	.0515– .06	.0515– .06	.0515– .06
Salsoda, bbl., cwt	1.00 – 1.05	1.00 – 1.05	1.00 – 1.05
Salt cake, bulk, ton	17.00 –......	17.00 –......	17.00 –......
Soda ash, light, 58%, bags, contract, cwt	1.05 –......	1.05 –......	1.05 –......
Dense, bags, cwt	1.10 –......	1.10 –......	1.10 –......
Soda, caustic, 76%, solid, drums, cwt	2.30 – 3.00	2.30 – 3.00	2.30 – 3.00
Acetate, del., bbl., lb	.05 – .06	.05 – .06	.05 – .06
Bicarbonate, bbl., cwt	1.70 – 2.00	1.70 – 2.00	1.70 – 2.00
Bichromate, casks, lb	.07¾– .08	.07¾– .08	.07¾– .08
Bisulphate, bulk, ton	16.00 –17.00	16.00 –17.00	16.00 –17.00
Bisulphite, bbl., lb	.03 – .04	.03 – .04	.03 – .04
Chlorate, kegs, lb	.06½– .06½	.06½– .06½	.06½– .06½
Cyanide, cases, dom., lb	.14 – .15	.14 – .15	.14 – .15
Fluoride, bbl., lb	.08 – .09	.08 – .09	.08 – .09
Hyposulphite, bbl., cwt	2.40 – 2.50	2.40 – 2.50	2.40 – 2.50
Metasilicate, bbl., cwt	2.50 – 2.65	2.50 – 2.65	2.50 – 2.65
Nitrate, bulk, cwt	1.35 –......	1.35 –......	1.35 –......
Nitrite, casks, lb	.06½– .07	.06½– .07	.06½– .07
Phosphate, tribasic, bags, lb	2.70 –......	2.70 –......	2.70 –......
Prussiate, yel. drums, lb	.10½– .11	.10½– .11	.10½– .11
Silicate (40° dr.), wks., cwt	.80 – .85	.80 – .85	.80 – .85
Sulphide, fused, 60–62%, dr. lb.	.03 – .03½	.03 – .03½	.03 – .03½
Sulphite, crys., bbl., lb	.02½– .02½	.02½– .02½	.02½– .02½
Sulphur, crude at mine, long ton	16.00 –......	16.00 –......	16.00 –......
Chloride, dr., lb	.03 – .04	.03 – .04	.03 – .04
Dioxide, cyl., lb	.07 – .08	.07 – .08	.07 – .08
Flour, bag, cwt	1.90 – 2.40	1.90 – 2.40	1.90 – 2.40
Tin Oxide, bbl., lb	.55 –......	.55 –......	.55 –......
Crystals, bbl., lb	.39½–......	.39½–......	.39½–......
Zinc, chloride, gran., bbl., lb.	.05¾– .06	.05¾– .06	.05 – .06
Carbonate, bbl., lb	.14 – .15	.14 – .15	.14 – .15
Cyanide, dr., lb	.33 – .35	.33 – .35	.33 – .35
Dust, bbl., lb	.1035–......	.1035–......	.10½–......
Oxide, lead free, bag, lb	.07¾–......	.07¾–......	.07¾–......
5% leaded, bags, lb	.07¾–......	.07¾–......	.07¾–......
Sulphate, bbl., cwt	3.85 – 4.00	3.85 – 4.00	3.40 – 3.50

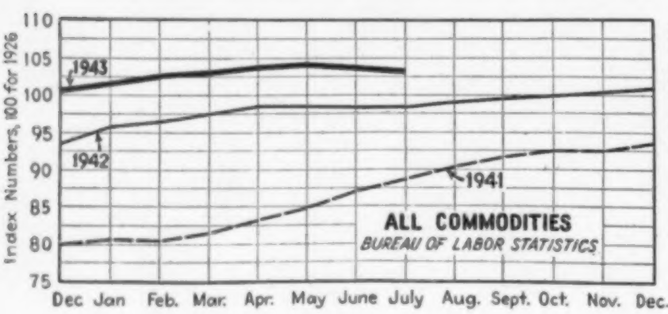
OILS AND FATS

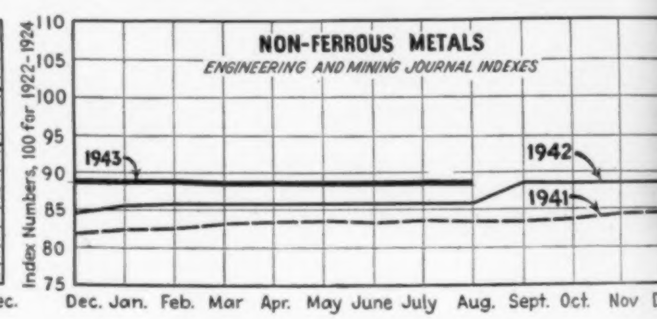
	Current Price	Last Month	Last Year
Castor oil, No. 3 bbl., lb	$0.13¾–$0.14½	$0.13¾–$0.14½	$0.13¾–$0.14½
Chinawood oil, bbl., lb	.38 –......	.38 –......	.38 –......
Coconut oil, Ceylon, tank, N. Y., lb	nom	nom	nom ......
Corn oil crude, tanks (f.o.b. mill), lb	.12¾–......	.12¾–......	.12¾–......
Cottonseed oil, crude (f.o.b. mill), tanks, lb	.12¾–......	.12¾–......	.12¾–......
Linseed oil, raw car lots, bbl., lb	.153–......	.153–......	.133–......
Palm, casks, lb	.09 –......	.09 –......	.09 –......
Peanut oil, crude, tanks (mill), lb.	.13 –......	.13 –......	.13 –......
Rapeseed oil, refined, bbl., lb	nom	nom	nom ......
Soya bean, tank, lb	.11¾–......	.11¾–......	.11¾–......
Sulphur (olive foots), bbl., lb	nom	nom	.19½–......
Cod, Newfoundland, bbl., gal	nom	nom	nom ......
Menhaden, light pressed, dr., lb	.1305–......	.1305–......	.114–......
Crude, tanks (f.o.b. factory) lb.	.089–......	.089–......	.088–......
Grease, yellow, loose, lb	.08¾–......	.08¾–......	.08¾–......
Oleo stearine, lb	.09½–......	.09½–......	.09½–......
Oleo oil, No. 1	.11¼–......	.11¼–......	.11¼–......
Red oil, distilled, dp.p. bbl., lb	.11¾–......	.11¾–......	.11¾–......
Tallow extra, loose, lb	.08¾–......	.08¾–......	.08¾–......

Chem. & Met.'s Weighted Price Indexes









Coal-Tar Products

	Current Price	Last Month	Last Year
Alpha-napthol, crude bbl., lb.	$0.52– $0.55	$0.52– $0.55	$0.52 –$0.55
Alpha-naphthylamine, bbl., lb.	.32 – .34	.32 – .34	.32 – .34
Aniline oil, drums, extra, lb.	.15 – .16	.15 – .16	.15 – .16
Aniline, salts, bbl., lb	.22 – .24	.22 – .24	.22 – .24
Benzaldehyde, U.S.P., dr., lb.	.85 – .95	.85 – .95	.85 – .95
Benzidine base, bbl., lb.	.70 – .75	.70 – .75	.70 – .75
Benzoic acid, U.S.P., kgs., lb.	.54 – .56	.54 – .56	.54 – .56
Benzyl chloride, tech., dr., lb	.23 – .25	.23 – .25	.23 – .25
Benzol, 90%, tanks, works, gal.	.15 –......	.15 –......	.14 –......
Beta-naphthol, tech., drums, lb.	.23 – .24	.23 – .24	.23 – .24
Cresol, U.S.P., dr., lb	.11 –......	.11 – .11	.10½– .11
Cresylic acid, dr., wks., gal	.81 – .83	.81 – .83	.81 – .83
Diethylaniline, dr., lb.	.40 – .45	.40 – .45	.40 – .45
Dinitrophenol, bbl., lb.	.23 – .25	.23 – .25	.23 – .25
Dinitrotoluol, bbl., lb.	.18 – .19	.18 – .19	.18 – .19
Dip oil, 15%, dr., gal	.23 – .25	.23 – .25	.23 – .25
Diphenylamine, dr. f.o.b. wks., lb.	.60 –......	.60 –......	.60 –......
H-acid, bbl., lb.	.45 – .50	.45 – .50	.45 – .50
Naphthalene, flake, bbl., lb	.07 – .07½	.07 – .07½	.07 – .07½
Nitrobenzene, dr., lb.	.08 – .09	.08 – .09	.08 – .09
Para-nitraniline, bbl., lb.	.47 – .49	.47 – .49	.47 – .49
Phenol, U.S.P., drums, lb.	.10½– .11	.10½– .11	.13 –......
Picric acid, bbl., lb	.35 – .40	.35 – .40	.35 – .40
Pyridine, dr., gal	1.70 – 1.80	1.70 – 1.80	1.70 – 1.80
Resorcinol, tech., kegs., lb	.75 – .80	.75 – .80	.75 – .80
Salicylic acid, tech., bbl., lb.	.33 – .40	.33 – .40	.33 – .40
Solvent naphtha, w.w., tanks, gal.	.27 –......	.27 –......	.27 –......
Tolidine, bbl., lb.	.86 – .88	.86 – .88	.86 – .88
Toluol, drums, works, gal.	.33 –......	.33 –......	.32 –......
Xylol, com., tanks, gal	.26 –......	.26 –......	.26 –......

Miscellaneous

	Current Price	Last Month	Last Year
Barytes, grd., white, bbl., ton	$22.00–$25.00	$22.00–$25.00	$22.00–$25 00
Casein, tech., bbl., lb.	.21 – .23½	.21 – .23½	.18– .19
China clay, dom., f.o.b. mine, ton.	8.00 –20.00	8.00 –20.00	8.00 –20.00
Dry colors			
Carbon gas, black (wks.), lb.	.0335– .30	.0335– .30	.0335– .30
Prussian blue, bbl., lb.	.36 – .37	.36 – .37	.36 – .37
Ultramarine blue, bbl., lb.	.11 – .26	.11 – .26	.11 – .26
Chrome green, bbl., lb.	.21½– .30	.21½– .30	.21½– .30
Carmine, red, tins, lb.	4.60 – 4.75	4.60 – 4.75	4.60 – 4.75
Para toner, lb.	.75 – .80	.75 – .80	75 – .80
Vermilion, English, bbl., lb.	3.05 – 3.10	3.05 – 3.10	3 05 – 3.10
Chrome yellow, C.P., bbl., lb.	.14½– .15¼	.14½– .15¼	.14½– .15¼
Feldspar, No. 1 (f.o.b.N.C.), ton.	6.50 – 7.50	6.50 – 7.50	6.50 – 7.50
Graphite, Ceylon, lump, bbl., lb.	.08 – .10	.08 – .10	.08 – .10
Gum copal Congo, bags, lb.	.09 – .30	.09 – .30	.09 – .30
Manila, bags, lb.	.09 – .15	.09 – .14	.09 .15
Damar, Batavia, cases, lb.	.10 – .22	.10 – .20	.10 – .22
Kauri, cases, lb.	.18 – .60	.17 – .60	.18 – .60
Kieselguhr (f.o.b. mines), ton.	7.00 –40.00	7.00 –40.00	7.00 –40.00
Magnesite, calc, ton.	64.00 –......	64.00 –......	64.00 –......
Pumice stone, lump, bbl., lb.	.05 – .07	.05 – .08	.05 = .07
Imported, casks, lb.	nom	nom	nom ......
Rosin, H., 100 lb.	4.57 –......	4.60–......	3.85–......
Turpentine, gal.	.75 –......	.74 –......	.64½–......
Shellac, orange, fine, bags, lb.	.39 –......	.39 –......	.39 –......
Bleached, bonedry, bags, lb.	.39 –......	.39 –......	.39 –......
T. N. bags, lb.	.31 –......	.31 –......	.31 –......
Soapstone (f.o.b. Vt.), bags, ton.	10.00 –12.00	10.00 –12.00	10.00 –12.00
Talc. 200 mesh (f.o.b. Vt.), ton.	8.00 – 8.50	8.00 – 8.50	8.00 – 8.50
200 mesh (f.o.b. Ga.), ton.	6.00 – 8.00	6.00 – 8.00	6.00 – 8.00

Industrial Notes

ALLIS-CHALMERS MFG. CO., Milwaukee, has placed Paul Dietz in charge of export sales for the general machinery division.

OWENS-CORNING FIBERGLAS CORP., Toledo, has appointed Marshall Burch manager of its new plant at Huntingdon, Pa. John Saalfield will be production superintendent and Walter Aikman plant engineer.

WHITING CORP., Harvey, Ill., has acquired a controlling interest in the LeVal Filter Co. of Chicago. LeVal operations will go on as usual and H. L. Pratt, vice-president will remain in charge.

PENNSYLVANIA SALT MFG. CO., Philadelphia, has assigned Edgar G. Warren to the heavy chemicals division to take over the Philadelphia territory.

MARCO CHEMICALS, Philadelphia, has transferred its business to Marco Chemicals, Inc. The Continental Can Co. and Vulcan Detinning Co. have acquired a substantial interest in the company which will operate at Sewaren, N. J.

THE BUFFALO FOUNDRY & MACHINE CO., Buffalo, has purchased the industrial kettle business of the Sowers Mfg. Co. of Buffalo.

H. K. PORTER CO., INC., Pittsburgh, has appointed F. B. Schwartz, manager of Minnesota Pneumatic & Electric Tool Co., Minneapolis, as its special representative for the Northwest.

GLOBE STEEL TUBES CO., Milwaukee, has made Thomas R. Coffey manager of sales of the Wisconsin-Minnesota district with headquarters at Milwaukee.

SEPARATIONS ENGINEERING CORP., New York, has moved its custom milling and cleaning plant to 10 Hubert St.

THE TIMKEN ROLLER BEARING CO., Canton, Ohio, has appointed S. R. Kallenbaugh district manager of the steel and tube division on the West Coast with headquarters at 1526 South Olive St., Los Angeles.

THE DURALOY CO., Scottdale, Pa., has appointed Robert Onan, Wrigley Bldg., Chicago, as its sales representative in that area. Kilsby & Graham, Standard Oil Bldg., Los Angeles, will represent the company in the California area.

INTERCHEMICAL CORP., New York, and the administrative offices of several operating divisions and subsidiaries were moved on Aug. 1 to the Empire State Bldg.

ELGIN SOFTENER CORP., Elgin, Ill., has appointed E. W. Scarritt sales manager.

CARRIER CORP., New York, has added C. Robert Powers to its manufacturing division at Syracuse in the capacity of production control manager.

NEW CONSTRUCTION

	Current Projects		Cumulative 1943	
	Proposed Work	Contracts	Proposed Work	Contracts
New England	....	$55,000	$335,000	$515,000
Middle Atlantic	$150,000	135,000	14,519,000	5,184,000
South	140,000	20,553,000	7,483,000	8,940,000
Middle West	230,000	170,000	9,190,000	9,815,000
West of Mississippi	40,000	1,540,000	13,930,000	12,055,000
Far West	....	77,000	15,525,000	57,126,000
Canada	....	265,000	11,086,000	1,785,000
Total	$560,000	$22,795,000	$72,068,000	$95,420,000

PROPOSED WORK

La., Gretna—Gulf Distilling Corp., Gretna, La., plans the construction of a yeast house. Walter B. Moses and Leo S. Weil, 427 South Peters St., New Orleans, Engrs. Project will be financed by Defense Plant Corp., Washington, D. C.

Miss., Gulfport—Phoenix Naval Store Co., North Gulfport, plans to rebuild its extractor and refinery recently destroyed by fire. Estimated cost $100,000.

N. Y., Olean—Socony Vacuum Oil Co., Inc., 1103 Elk St., Buffalo, plans to construct an addition to its crude oil refinery here. Project will be financed by Defense Plant Corp., Washington, D. C. Estimated cost $150,000.

O., Akron—Goodyear Tire & Rubber Co., 1144 East Market St., Akron, is having plans prepared by J. Gordon Turnbull, Engr., 9630 Chester Ave., Cleveland, for the construction of a laboratory. Estimated cost will exceed $150,000.

O., Middlefield—Johnson Rubber Co., J. Johnson, Pres., plans to rebuild its factory, warehouse and shipping building. Estimated cost $40,000.

Tex., Mexia—Munger Cotton Oil Co., Mexia, plans to reconstruct its storage and plant facilities for cotton mill and gin. Estimated cost $40,000.

Wis., Janesville — Wisconsin Soybean Corp., Janesville, plans the construction of a soybean processing plant.

CONTRACTS AWARDED

Alabama—Johnston & Jennings Co., 877 Addison St., Cleveland, O., has awarded the contract for the construction of a detinning plant to the H. K. Ferguson Co., Hanna Bldg., Cleveland. Estimated cost $2,000,000.

Calif., San Pedro—The Texas Co., 929 South Broadway, Los Angeles, has awarded the contract for refinery buildings here to Foster-Wheeler Corp., 714 West Olympic Blvd., Los Angeles. Estimated cost $77,000.

Ind., Lapel—Sterling Glass Co., Lapel, has awarded the contract for a 1 story, 86x260 ft. plant to Carl M. Geupel Construction Co., 923 Hume Mansur Bldg., Indianapolis, at $50,000, cost plus percentage basis.

Ky., Frankfort — Schenley Distillers, Inc., C. J. Kiefer, Vice Pres., 26 East 6th St., Cincinnati, O., has awarded the contract for the construction of a protein recovery plant, including 2 story dry house, boiler plant alterations and yeast room, to Frank Messer & Sons, Inc., 2515 Burnett St., Cincinnati. Estimated cost $553,000.

Md., Baltimore—E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., has awarded the contract for a soda dissolving plant to Consolidated Engineering Co., 20 East Franklin St., Baltimore.

Md., Baltimore—Koppers Co., Koppers Bldg., Pittsburgh, Pa., has awarded the contract for a 1 story, 65x95 ft. laboratory at Bush and Wicomico Sts., to Morrow Bros., 14 East Eager St. Estimated cost $45,000.

Mass., Springfield—Monsanto Chemical Co., 600 Main St., Indian Orchard, has awarded the contract for 2 and 4 story, 40x100 ft. and 25x95 ft. resinox unit additions, to J. G. Roy & Sons Co., 21 Silver St., Springfield. Estimated cost $55,000.

N. J., Newark — Celanese Corp. of America, 290 Ferry St., has awarded the contract for a 2 story pulverizing building and buffing building, to Schouler Construction Co., 183 Frelinhuysen Ave. Estimated cost $50,000.

Ohio—Rubber Reserve Co., 1452 East Archwood Ave., Akron, has awarded the contract for a laboratory and machine shop to Indiana Engineering & Construction Co., 109 North Union St., Akron. Estimated cost $40,000.

O., Cleveland — American Magnesium Corp., 2600 Harvard Ave., has awarded the contract for the construction of a 46x82 ft. laboratory and locker building, 1 story, 57x114 ft. office building and 27x40 ft. shop building, to Sam W. Emerson Co., 1836 Euclid Ave. Estimated cost $80,000.

Tenn., Raines Station—Defense Plant Corp., 811 Vermont Ave., N. W., Washington, D. C., has awarded the contract for the construction of an aluminum plant to be operated by Reynolds Metals Co., Louisville, Ky., to Struck Construction Co., 147 North Clay St., Louisville. Estimated cost $18,000,000.

Texas—Defense Plant Corp., 811 Vermont Ave., N. W., Washington, D. C., will build a synthetic rubber plant under the supervision of the Goodyear Rubber Co., 1144 East Market St., Akron, O., and General Tire & Rubber Co., 1708 East Market St., Akron, who will operate plant. Estimated cost $1,250,000.

Tex., Baytown—Humble Oil & Refining Co. will repair and improve new Tuluol plant recently damaged by hurricane. Work will be done by force account. Estimated cost $100,000.

Tex., Ebanos—McBride Refining Co., c/o H. L. McBride, Edinburg, Tex., will construct a gathering pipeline system to transport crude oil from fields and deliver to refineries. Work will be done by force account. Estimated cost $70,000.

Tex., Houston—Shell Oil Co., Deere Park, will repair and improve oil refinery and rubber plant recently damaged by hurricane. Work will be done by force account. Estimated cost will exceed $40,000.

Tex., Texas City—Republic Oil & Refining Co., Texas City, will reconstruct three cooling towers at large refinery plant. Work will be done by force account. Estimated cost $80,000.

Ont., Cardinal—Canada Starch Co., Ltd., 637 Craig St., W., Montreal, Que., has awarded the contract for alterations and additions to its plant to Dodge Construction Co., Ltd., Cornwall, at $70,500.

Que., Montreal—Canadian Oil Co., Ltd., Terminal Bldg., Toronto, Ont., has awarded the contract for 2 story, 70x80 ft. and 36x70 ft. additions to its plant to W. H. Harvey & Son, 56 Kensington Ave., Kingston, Ont. Estimated cost $40,000.

Que., Shawinigan Falls—Aluminum Co. of Canada, Ltd., 1700 Sun Life Bldg., Montreal, has awarded the contract for alterations to its laboratory and installation of equipment, to Fraser-Brace, Ltd., 360 St. James St., W., Montreal, at $154,000.